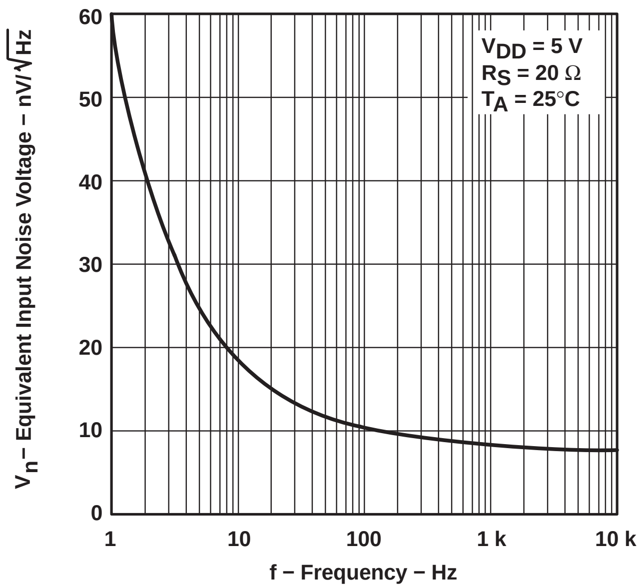
- **B Grade Is 100% Tested for Noise**
  30 nV/√Hz Max at f = 10 Hz
  12 nV/√Hz Max at f = 1 kHz
- **Low Input Offset Voltage . . . 500 μV Max**
- **Excellent Offset Voltage Stability With Temperature . . . 0.5 μV/°C Typ**
- **Rail-to-Rail Output Swing**
- **Low Input Bias Current**
  1 pA Typ at T_A = 25°C
- **Common-Mode Input Voltage Range Includes the Negative Rail**
- **Fully Specified For Both Single-Supply and Split-Supply Operation**

description

The TLC220x, TLC220xA, TLC220xB, and TLC220xY are precision, low-noise operational amplifiers using Texas Instruments Advanced LinCMOS™ process. These devices combine the noise performance of the lowest-noise JFET amplifiers with the dc precision available previously only in bipolar amplifiers. The Advanced LinCMOS™ process uses silicon-gate technology to obtain input offset voltage stability with temperature and time that far exceeds that obtainable using metal-gate technology. In addition, this technology makes possible input impedance levels that meet or exceed levels offered by top-gate JFET and expensive dielectric-isolated devices.

The combination of excellent DC and noise performance with a common-mode input voltage range that includes the negative rail makes these devices an ideal choice for high-impedance, low-level signal-conditioning applications in either single-supply or split-supply configurations.

TYPICAL EQUIVALENT INPUT NOISE VOLTAGE vs FREQUENCY



The device inputs and outputs are designed to withstand −100-mA surge currents without sustaining latch-up. In addition, internal ESD-protection circuits prevent functional failures at voltages up to 2000 V as tested under MIL-PRF-38535, Method 3015.2; however, care should be exercised in handling these devices as exposure to ESD may result in degradation of the parametric performance.

The C-suffix devices are characterized for operation from 0°C to 70°C. The I-suffix devices are characterized for operation from −40°C to 85°C. The M-suffix devices are characterized for operation over the full military temperature range of −55°C to 125°C.

TLC2201 AVAILABLE OPTIONS

T_A	V_{IO}max AT 25°C	$V_n$max f = 10 Hz AT 25°C	$V_n$max f = 1 kHz AT 25°C	PACKAGED DEVICES				CHIP FORM‡ (Y)
				SMALL OUTLINE† (D)	CHIP CARRIER (FK)	CERAMIC DIP (JG)	PLASTIC DIP (P)	
0°C to 70°C	200 µV	35 nV/√Hz	15 nV/√Hz	TLC2201ACD	—	—	TLC2201ACP	TLC2201Y
	200 µV	30 nV/√Hz	12 nV/√Hz	TLC2201BCD			TLC2201BCP	
	500 µV	—	—	TLC2201CD			TLC2201CP	
−40°C to 85°C	200 µV	35 nV/√Hz	15 nV/√Hz	TLC2201AID	—	—	TLC2201AIP	—
	200 µV	30 nV/√Hz	12 nV/√Hz	TLC2201BID			TLC2201BIP	
	500 µV	—	—	TLC2201ID			TLC2201IP	
−55°C to 125°C	200 µV	35 nV/√Hz	15 nV/√Hz	TLC2201AMD	TLC2201AMFK	TLC2201AMJG	TLC2201AMP	—
	200 µV	30 nV/√Hz	12 nV/√Hz	TLC2201BMD	TLC2201BMFK	TLC2201BMJG	TLC2201BMP	
	500 µV	—	—	TLC2201MD	TLC2201MFK	TLC2201MJG	TLC2201MP	

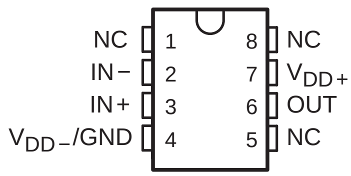
† The D packages are available taped and reeled. Add R suffix to device type (e.g. TLC220xBCDR).
‡ Chip forms are tested at 25°C only.

TLC2202 AVAILABLE OPTIONS

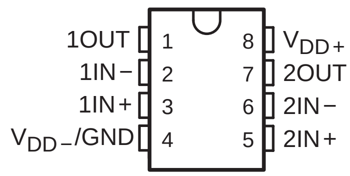
T_A	V_{IO}max AT 25°C	$V_n$max f = 10 Hz AT 25°C	$V_n$max f = 1 kHz AT 25°C	PACKAGED DEVICES					CHIP FORM‡ (Y)
				SMALL OUTLINE† (D)	PLASTIC SMALL OUTLINE (PS)	CHIP CARRIER (FK)	CERAMIC DIP (JG)	PLASTIC DIP (P)	
0°C to 70°C	500 µV	30 nV/√Hz	12 nV/√Hz	TLC2202BCD	—	—	—	TLC2202BCP	TLC2202Y
	500 µV	35 nV/√Hz	15 nV/√Hz	TLC2202ACD	—	—	—	TLC2202ACP	
	1 mV	—	—	TLC2202CD	TLC2202CPSR	—	—	TLC2202CP	
−40°C to 85°C	500 µV	30 nV/√Hz	12 nV/√Hz	TLC2202BID	—	—	—	TLC2202BIP	—
	500 µV	35 nV/√Hz	15 nV/√Hz	TLC2202AID	—	—	—	TLC2202AIP	
	1 mV	—	—	TLC2202ID	—	—	—	TLC2202IP	
−55°C to 125°C	500 µV	30 nV/√Hz	12 nV/√Hz	TLC2202BMD	—	TLC2202BMFK	TLC2202BMJG	TLC2202BMP	—
	500 µV	35 nV/√Hz	15 nV/√Hz	TLC2202AMD	—	TLC2202AMFK	TLC2202AMJG	TLC2202AMP	
	1 mV	—	—	TLC2202MD	—	TLC2202MFK	TLC2202MJG	TLC2202MP	

† The D packages are available taped and reeled. Add R suffix to device type (e.g. TLC220xBCDR).
‡ Chip forms are tested at 25°C only.

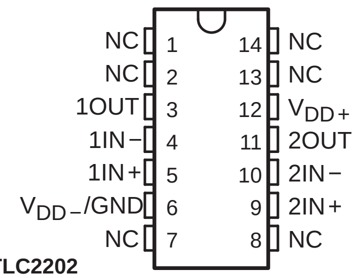
TLC2201
D, JG, OR P PACKAGE
(TOP VIEW)



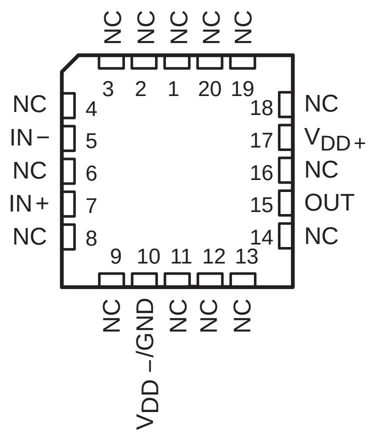
TLC2202
PS, JG, OR P PACKAGE
(TOP VIEW)



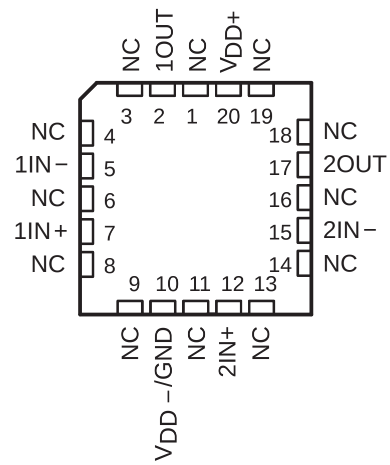
TLC2202
D PACKAGE
(TOP VIEW)



TLC2201
FK PACKAGE
(TOP VIEW)

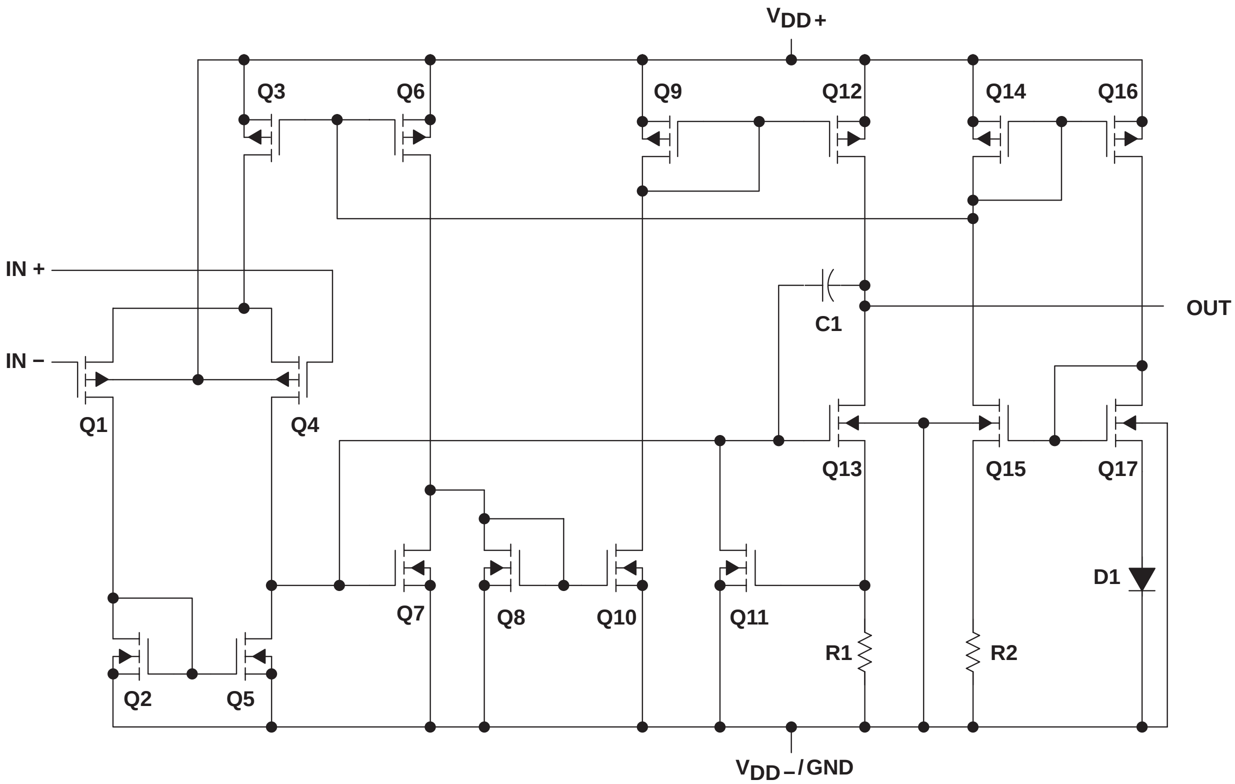


TLC2202
FK PACKAGE
(TOP VIEW)



NC − No internal connection

equivalent schematic (each amplifier)

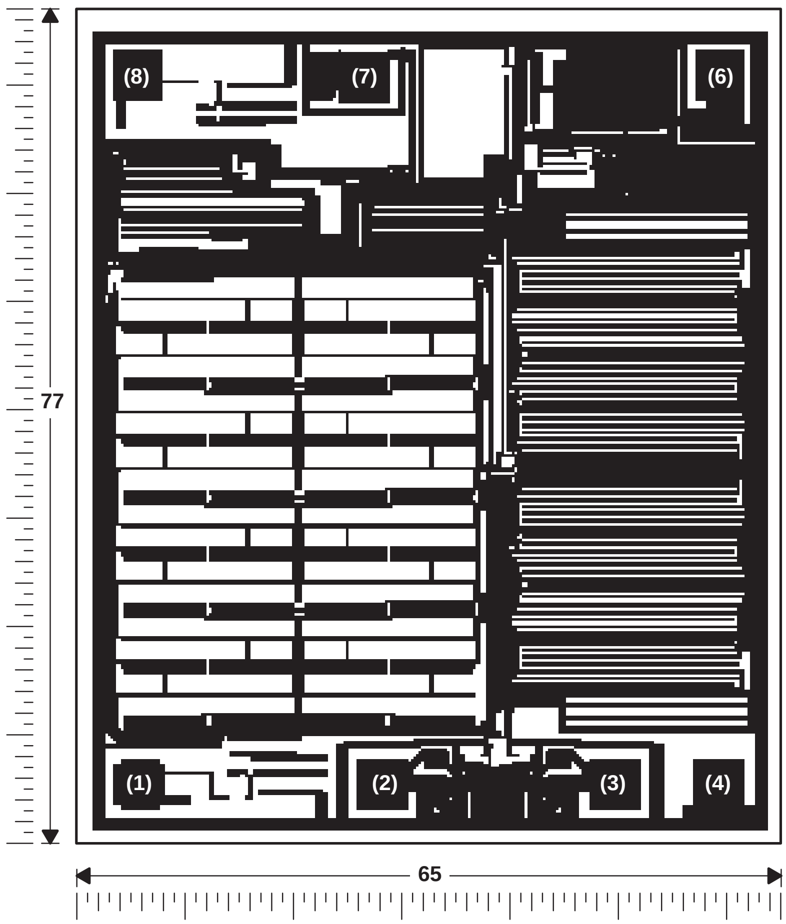


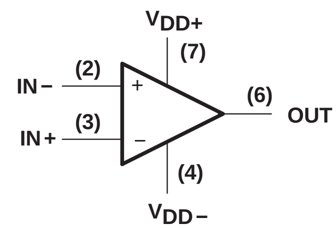
ACTUAL DEVICE COMPONENT COUNT		
COMPONENT	TLC2201	TLC2202
Transistors	17	34
Resistors	2	2
Diodes	1	4
Capacitors	1	2

TLC2201Y chip information

This chip, when properly assembled, displays characteristics similar to the TLC2201C. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding path. Chips may be mounted with conductive epoxy or a gold-silicon preform.

BONDING PAD ASSIGNMENTS





CHIP THICKNESS: 15 MILS TYPICAL

BONDING PADS: 4 × 4 MILS MINIMUM

$T_J$max = 150°C

TOLERANCES ARE ±10%.

ALL DIMENSIONS ARE IN MILS.

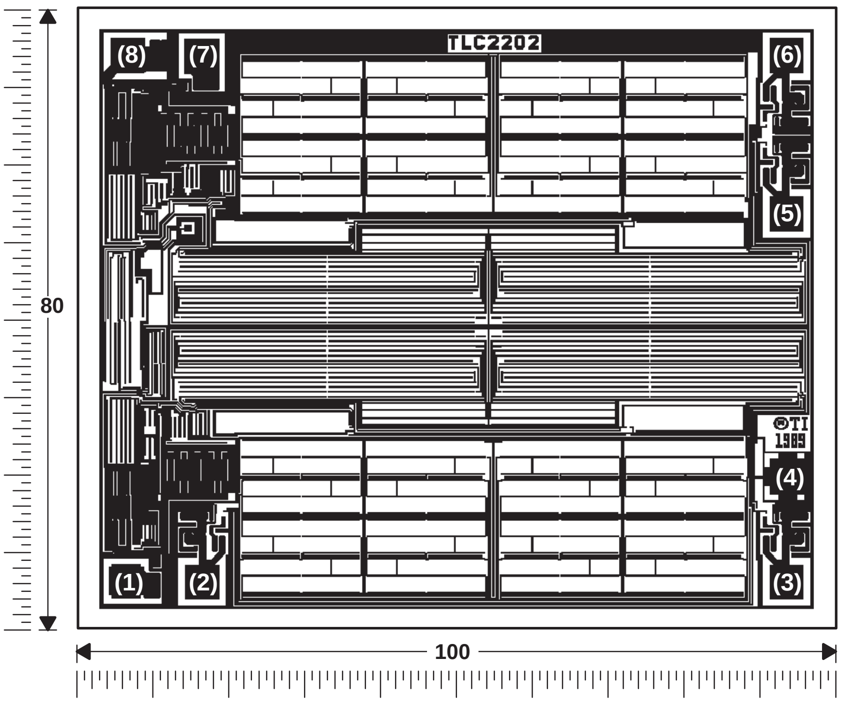
PIN (4) IS INTERNALLY CONNECTED TO BACK SIDE OF CHIP.

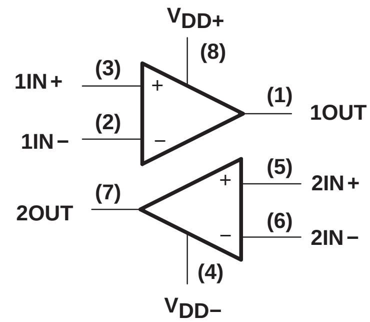
TERMINAL NUMBERS ARE FOR THE D, JG, AND P PACKAGES.

TLC2202Y chip formation

This chip, when properly assembled, displays characteristics similar to the TLC2202C. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips may be mounted with conductive epoxy or a gold-silicon preform.

BONDING PAD ASSIGNMENTS





CHIP THICKNESS: 15 MILS TYPICAL

BONDING PADS: 4 × 4 MILS MINIMUM

$T_J$max = 150°C

TOLERANCES ARE ±10%.

ALL DIMENSIONS ARE IN MILS.

PIN (4) IS INTERNALLY CONNECTED TO BACKSIDE OF CHIP.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, V_{DD+} (see Note 1) . . . . 8 V
Supply voltage, V_{DD-} . . . . −8 V
Differential input voltage, V_{ID} (see Note 2) . . . . ±16 V
Input voltage, V_I (any input) . . . . ±8 V
Input current, I_I (each input) . . . . ±5 mA
Output current, I_O (each output) . . . . ±50 mA
Duration of short-circuit current at (or below) 25°C (see Note 3) . . . . unlimited
Continuous total dissipation . . . . See Dissipation Rating Table
Operating free-air temperature range, T_A: C suffix . . . . 0°C to 70°C
I suffix . . . . −40°C to 85°C
M suffix . . . . −55°C to 125°C
Storage temperature range . . . . −65°C to 150°C
Case temperature for 60 seconds: FK package . . . . 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D, PS, or P package . . . . 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG package . . . . 300°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values except differential voltages are with respect to the midpoint between V_{DD+} and V_{DD-}.
2. Differential voltages are at IN+ with respect to IN−.
3. The output may be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating in not exceeded.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE T_A = 25°C	T_A = 70°C POWER RATING	T_A = 85°C POWER RATING	T_A = 125°C POWER RATING
D−8	725 mW	5.8 mW/°C	464 mW	377 mW	145 mW
D−14	950 mW	7.6 mW/°C	608 mW	494 mW	190 mW
PS	770 mW	6.2 mW/°C	496 mW	403 mW	155 mW
FK	1375 mW	11.0 mW/°C	880 mW	715 mW	275 mW
JG	1050 mW	8.4 mW/°C	672 mW	546 mW	210 mW
P	1000 mW	8.0 mW/°C	640 mW	520 mW	200 mW

recommended operating conditions

	C SUFFIX		I SUFFIX		M SUFFIX		UNIT
	MIN	MAX	MIN	MAX	MIN	MAX	
Supply voltage, $V_{DD\pm}$	±2.3	±8	±2.3	±8	±2.3	±8	V
Common-mode input voltage, V_{IC}	V_{DD-}	V_{DD+} −2.3	V_{DD-}	V_{DD+} −2.3	V_{DD-}	V_{DD+} −2.3	V
Operating free-air temperature, T_A	0	70	−40	85	−55	125	°C

TLC2201C electrical characteristics at specified free-air temperature, $V_{DD\pm} = \pm 5$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201C MIN	TLC2201C TYP	TLC2201C MAX	UNIT
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$	25°C		100	500	µV
			Full range			600	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			100	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			100	
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$	Full range	−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	$R_L = 10\ k\Omega$	25°C	4.7	4.8		V
			Full range	4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		V
			Full range	−4.7			
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm 4$ V, $R_L = 500\ k\Omega$	25°C	400	560		V/mV
			Full range	300			
		$V_O = \pm 4$ V, $R_L = 10\ k\Omega$	25°C	90	100		
			Full range	70			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$	Full range	85			dB
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm} / \Delta V_{IO}$)	$V_{DD\pm} = \pm 2.3$ V to ± 8 V	25°C	90	110		dB
			Full range	85			
I_{DD}	Supply current	$V_O = 0$, No load	25°C		1.1	1.5	mA
			Full range			1.5	

† Full range is 0°C to +70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$°C extrapolated to $T_A = 25$°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201C operating characteristics at specified free-air temperature, $V_{DD\pm} = \pm 5$ V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201C MIN	TLC2201C TYP	TLC2201C MAX	UNIT
SR	Slew rate at unity gain	$V_O = \pm 2.3$ V, $R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C	2	2.7		V/µs
			Full range	1.5			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		$nV/\sqrt{Hz}$
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		$fA/\sqrt{Hz}$
	Gain-bandwidth product	f = 10 kHz, $R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C		1.9		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C		48°		

† Full range is 0°C to +70°C.

TLC2201C electrical characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AC MIN	TLC2201AC TYP	TLC2201AC MAX	TLC2201BC MIN	TLC2201BC TYP	TLC2201BC MAX	UNIT
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$	25°C		80	200		80	200	µV
			Full range			300			300	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			100			100	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			100			100	
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$	Full range	−5 to 2.7			−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	$R_L = 10\ k\Omega$	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		−4.7	−4.9		V
			Full range	−4.7			−4.7			
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm4$ V, $R_L = 500\ k\Omega$	25°C	400	560		400	560		V/mV
			Full range	300			300			
		$V_O = \pm4$ V, $R_L = 10\ k\Omega$	25°C	90	100		90	100		
			Full range	70			70			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min, $V_O = 0$, $R_S = 50\ \Omega$	25°C	90	115		90	115		dB
			Full range	85			85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD\pm} = \pm2.3$ V to ±8 V	25°C	90	110		90	110		dB
			Full range	85			85			
I_{DD}	Supply current	$V_O = 0$, No load	25°C		1.1	1.5		1.1	1.5	mA
			Full range			1.5			1.5	

† Full range is 0°C to +70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$°C extrapolated to $T_A = 25$°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201C operating characteristics at specified free-air temperature, $V_{DD\pm} = \pm 5$ V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AC			TLC2201BC			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	$V_O = \pm 2.3$ V, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C	2	2.7		2	2.7		V/µs
			Full range	1.5			1.5			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/$\sqrt{Hz}$
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/$\sqrt{Hz}$
	Gain-bandwidth product	f = 10 kHz, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C		1.9			1.9		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10$ kΩ, $C_L = 100$ pF	25°C		48°			48°		

† Full range is 0°C to +70°C.

NOTE 5: This parameter is tested on a sample basis for the TLC2201A and on all devices for the TLC2201B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2201C electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201C MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		100	500	μV
			Full range			600	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	μV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			100	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			100	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50	mV
			Full range			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		V/mV
			Full range	100			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		
			Full range	15			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min, V_O = 0, R_S = 50 Ω	25°C	90	110		dB
			Full range	85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	90	110		dB
			Full range	85			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1	1.5	mA
			Full range			1.5	

† Full range is 0°C to +70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201C operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201C MIN	TYP	MAX	UNIT
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.8	2.5		V/μs
			Full range	1.3			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		nV/√Hz
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.8		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		45°		

† Full range is 0°C to +70°C.

TLC2201C electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AC			TLC2201BC			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		80	200		80	200	μV
			Full range			300			300	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	μV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			100			100	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			100			100	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50		0	50	mV
			Full range			50			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		150	315		V/mV
			Full range	100			100			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		25	55		
			Full range	15			15			
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR}min, V_O = 0, R_S = 50 Ω	25°C	90	110		90	110		dB
			Full range	85			85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	90	110		90	110		dB
			Full range	85			85			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1	1.5		1	1.5	mA
			Full range			1.5			1.5	

† Full range is 0°C to +70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201C operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AC			TLC2201BC			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.8	2.5		1.8	2.5		V/μs
			Full range	1.3			1.3			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/$\sqrt{Hz}$
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/$\sqrt{Hz}$
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.8			1.8		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		45°			45°		

† Full range is 0°C to +70°C.

NOTE 5: This parameter is tested on a sample basis for the TLC2201A and on all devices for the TLC2201B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2202C electrical characteristics at specified free-air temperature, $V_{DD\pm}$ = ±5 V (unless otherwise specified)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202C MIN	TLC2202C TYP	TLC2202C MAX	UNIT
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		100	1000	μV
			Full range			1150	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	μV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			100	
I_{IB}	Input bias current		25°C		1	60	
			Full range			100	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	R_L = 10 kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		
			Full range	−4.7			V
A_{VD}	Large-signal differential voltage amplification	V_O = ±4 V, R_L = 500 kΩ	25°C	300	560		V/mV
			Full range	200			
		V_O = ±4 V, R_L = 10 kΩ	25°C	50	100		
			Full range	25			
CMRR	Common-mode rejection ratio	V_O = 0, $V_{IC} = V_{ICR}$min, R_S = 50 Ω	25°C	80	115		dB
			Full range	80			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD\pm}$ = ±2.3 V to ±8 V	25°C	80	110		dB
			Full range	80			
I_{DD}	Supply current	V_O = 0, No load	25°C		1.8	2.7	mA
			Full range			2.7	

† Full range is 0°C to +70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202C operating characteristics at specified free-air temperature, $V_{DD\pm}$ = ±5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202C MIN	TLC2202C TYP	TLC2202C MAX	UNIT
SR	Slew rate at unity gain	V_O = ±2.3 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.8	2.7		V/μs
			Full range	1.3			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		nV/$\sqrt{Hz}$
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		fA/$\sqrt{Hz}$
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.9		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		48°		

† Full range is 0°C to +70°C.

TLC2202C electrical characteristics at specified free-air temperature, $V_{DD\pm} = \pm 5$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AC MIN	TLC2202AC TYP	TLC2202AC MAX	TLC2202BC MIN	TLC2202BC TYP	TLC2202BC MAX	UNIT
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$	25°C		80	500		80	500	µV
			Full range			650			650	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			100			100	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			100			100	
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$	Full range	−5 to 2.7			−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	$R_L = 10\ k\Omega$	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		−4.7	−4.9		V
			Full range	−4.7			−4.7			
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm 4$ V, $R_L = 500\ k\Omega$	25°C	300	560		300	560		V/mV
			Full range	200			200			
		$V_O = \pm 4$ V, $R_L = 10\ k\Omega$	25°C	50	100		50	100		
			Full range	25			25			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min, $V_O = 0$, $R_S = 50\ \Omega$	25°C	80	115		80	115		dB
			Full range	80			80			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD\pm} = \pm 2.3$ V to ± 8 V	25°C	80	110		80	110		dB
			Full range	80			80			
I_{DD}	Supply current	$V_O = 0$, No load	25°C		1.8	2.7		1.8	2.7	mA
			Full range			2.7			2.7	

† Full range is 0°C to +70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150°C$ extrapolated to $T_A = 25°C$ using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202C operating characteristics at specified free-air temperature, $V_{DD\pm} = \pm 5$ V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AC MIN	TLC2202AC TYP	TLC2202AC MAX	TLC2202BC MIN	TLC2202BC TYP	TLC2202BC MAX	UNIT
SR	Slew rate at unity gain	$V_O = \pm 2.3$ V, $R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C	1.8	2.7		1.8	2.7		V/µs
			Full range	1.3			1.3			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/√Hz
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, $R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C		1.9			1.9		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C		48°			48°		

† Full range is 0°C to +70°C.

NOTE 5: This parameter is tested on a sample basis for the TLC2202A and on all devices for the TLC2202B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2202C electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202C MIN	TLC2202C TYP	TLC2202C MAX	UNIT
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		100	1000	µV
			Full range			1150	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			100	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			100	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50	mV
			Full range			50	
A_{VD}	Large-signal differential voltage amplification	V_O =1 V to 4 V, R_L = 500 kΩ	25°C	150	315		V/mV
			Full range	100			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		
			Full range	15			
CMRR	Common-mode rejection ratio	V_O = 0, $V_{IC} = V_{ICR}$min, R_S = 50 Ω	25°C	75	110		dB
			Full range	75			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD}= 4.6 V to 16 V	25°C	80	110		dB
			Full range	80			
I_{DD}	Supply current	V_O = 0, No load	25°C		1.7	2.6	mA
			Full range			2.6	

† Full range is 0°C to +70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202C operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202C MIN	TLC2202C TYP	TLC2202C MAX	UNIT
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.6	2.5		V/µs
			Full range	1.1			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		nV/√Hz
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.9		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		47°		

† Full range is 0°C to +70°C.

TLC2202C electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AC			TLC2202BC			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		80	500		80	500	µV
			Full range			650			650	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			100			100	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			100			100	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50		0	50	mV
			Full range			50			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		150	315		V/mV
			Full range	100			100			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		25	55		
			Full range	15			15			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min, V_O = 0, R_S = 50 Ω	25°C	75	110		75	110		dB
			Full range	75			75			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	80	110		80	110		dB
			Full range	80			80			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1.7	2.6		1.7	2.6	mA
			Full range			2.6			2.6	

† Full range is 0°C to +70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202C operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AC			TLC2202BC			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.6	2.5		1.6	2.5		V/µs
			Full range	1.1			1.1			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/√Hz
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.9			1.9		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		47°			47°		

† Full range is 0°C to +70°C.

NOTE 5: This parameter is tested on a sample basis for the TLC2202A and on all devices for the TLC2202B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2201I electrical characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201I MIN	TLC2201I TYP	TLC2201I MAX	UNIT
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$	25°C		100	500	µV
			Full range			650	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			150	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			150	
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$	Full range	−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	$R_L = 10\ k\Omega$	25°C	4.7	4.8		V
			Full range	4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		V
			Full range	−4.7			
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm4$ V, $R_L = 500\ k\Omega$	25°C	400	560		V/mV
			Full range	250			
		$V_O = \pm4$ V, $R_L = 10\ k\Omega$	25°C	90	100		
			Full range	65			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$	25°C	90	115		dB
			Full range	85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD\pm} = \pm2.3$ V to ±8 V	25°C	90	110		dB
			Full range	85			
I_{DD}	Supply current	$V_O = 0$, No load	25°C		1.1	1.5	mA
			Full range			1.5	

† Full range is −40°C to +85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$°C extrapolated to $T_A = 25$°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201I operating characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201I MIN	TLC2201I TYP	TLC2201I MAX	UNIT
SR	Slew rate at unity gain	$V_O = \pm2.3$ V, $R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C	2	2.7		V/µs
			Full range	1.4			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		$nV/\sqrt{Hz}$
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		$fA/\sqrt{Hz}$
	Gain-bandwidth product	f = 10 kHz, $R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C		1.9		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C		48°		

† Full range is −40°C to +85°C.

TLC2201I electrical characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AI			TLC2201BI			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$	25°C		80	200		80	200	μV
			Full range			350			350	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	μV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			150			150	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			150			150	
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$	Full range	−5 to 2.7			−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	$R_L = 10\ k\Omega$	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		−4.7	−4.9		V
			Full range	−4.7			−4.7			
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm4$ V, $R_L = 500\ k\Omega$	25°C	400	560		400	560		V/mV
			Full range	250			250			
		$V_O = \pm4$ V, $R_L = 10\ k\Omega$	25°C	90	100		90	100		
			Full range	65			65			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$	25°C	90	115		90	115		dB
			Full range	85			85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD\pm} = \pm2.3$ V to ±8 V	25°C	90	110		90	110		dB
			Full range	85			85			
I_{DD}	Supply current	$V_O = 0$, No load	25°C		1.1	1.5		1.1	1.5	mA
			Full range			1.5			1.5	

† Full range is −40°C to +85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150 °C extrapolated to T_A = 25°C using the Arrhenius equation assuming an activation energy of 0.96 eV.

TLC2201I operating characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AI			TLC2201BI			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	$V_O = \pm2.3$ V, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C	2	2.7		2	2.7		V/µs
			Full range	1.4			1.4			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/√Hz
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C		1.9			1.9		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10$ kΩ, $C_L = 100$ pF	25°C		48°			48°		

† Full range is −40°C to +85°C.

NOTE 5: This parameter is tested on a sample basis for the TLC2201A and on all devices for the TLC2201B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2201I electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201I			UNIT
				MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		100	500	μV
			Full range			650	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	μV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			150	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			150	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50	mV
			Full range			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		V/mV
			Full range	100			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		
			Full range	15			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min, V_O = 0, R_S = 50 Ω	25°C	90	110		dB
			Full range	85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	90	110		dB
			Full range	85			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1	1.5	mA
			Full range			1.5	

† Full range is −40°C to +85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201I operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201I			UNIT
				MIN	TYP	MAX	
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ,, C_L = 100 pF	25°C	1.8	2.5		V/μs
			Full range	1.2			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		$nV/\sqrt{Hz}$
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		$fA/\sqrt{Hz}$
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.8		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		45°		

† Full range is −40°C to +85°C.

TLC2201I electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AI			TLC2201BI			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		80	200		80	200	μA
			Full range			350			350	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	μV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			150			150	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			150			150	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50		0	50	mV
			Full range			50			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		150	315		V/mV
			Full range	100			100			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		25	55		
			Full range	15			15			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min, V_O = 0, R_S = 50 Ω	25°C	90	110		90	110		dB
			Full range	85			85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	90	110		90	110		dB
			Full range	85			85			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1	1.5		1	1.5	mA
			Full range			1.5			1.5	

† Full range is −40°C to +85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201I operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AI			TLC2201BI			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.8	2.5		1.8	2.5		V/μs
			Full range	1.2			1.2			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/√Hz
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.8			1.8		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		45°			45°		

† Full range is −40°C to +85°C.

NOTE 5: This parameter is tested on a sample basis for the TLC2201A and on all devices for the TLC2201B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2202I electrical characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202I MIN	TLC2202I TYP	TLC2202I MAX	UNIT
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$	25°C		100	1000	μV
			Full range			1200	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	μV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			150	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			150	
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$	Full range	−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	$R_L = 10$ kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		
			Full range	−4.7			V
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm4$ V, $R_L = 500$ kΩ	25°C	300	560		V/mV
			Full range	150			
		$V_O = \pm4$ V, $R_L = 10$ kΩ	25°C	50	100		
			Full range	25			
CMRR	Common-mode rejection ratio	$V_O = 0$, $V_{IC} = V_{ICR}$min, $R_S = 50\ \Omega$	25°C	80	115		dB
			Full range	80			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD} = \pm2.3$ V to ±8 V	25°C	80	110		dB
			Full range	80			
I_{DD}	Supply current	$V_O = 0$, No load	25°C		1.8	2.7	mA
			Full range			2.7	

† Full range is −40°C to +85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$°C extrapolated to $T_A = 25$°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202I operating characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202I MIN	TLC2202I TYP	TLC2202I MAX	UNIT
SR	Slew rate at unity gain	$V_O = \pm2.3$ V, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C	1.8	2.7		V/μs
			Full range	1.2			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		$nV/\sqrt{Hz}$
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		$fA/\sqrt{Hz}$
	Gain-bandwidth product	f = 10 kHz, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C		1.9		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10$ kΩ, $C_L = 100$ pF	25°C		48°		

† Full range is −40°C to +85°C.

TLC2202I electrical characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AI			TLC2202BI			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$	25°C		80	500		80	500	µV
			Full range			700			700	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			150			150	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			150			150	
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$	Full range	−5 to 2.7			−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	$R_L = 10\ k\Omega$	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		−4.7	−4.9		V
			Full range	−4.7			−4.7			
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm 4$ V, $R_L = 500\ k\Omega$	25°C	300	560		300	560		V/mV
			Full range	150			150			
		$V_O = \pm 4$ V, $R_L = 10\ k\Omega$	25°C	50	100		50	100		
			Full range	25			25			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min, $V_O = 0$, $R_S = 50\ \Omega$	25°C	80	115		80	115		dB
			Full range	80			80			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD\pm}$ ±2.3 V to ±8 V	25°C	80	110		80	110		dB
			Full range	80			80			
I_{DD}	Supply current	$V_O = 0$, No load	25°C		1.8	2.7		1.8	2.7	mA
			Full range			2.7			2.7	

† Full range is −40°C to +85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150°C$ extrapolated to $T_A = 25°C$ using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202I operating characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AI			TLC2202BI			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	$V_O = \pm2.3$ V, $R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C	1.8	2.7		1.8	2.7		V/µs
			Full range	1.2			1.2			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/√Hz
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, $R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C		1.9			1.9		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10\ k\Omega$, $C_L = 100$ pF	25°C		48°			48°		

† Full range is −40°C to +85°C.

NOTE 5: This parameter is tested on a sample basis for the TLC2202A and on all devices for the TLC2202B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2202I electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202I MIN	TLC2202I TYP	TLC2202I MAX	UNIT
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		100	1000	μV
			Full range			1200	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	μV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			150	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			150	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50	mV
			Full range			50	
A_{VD}	Large-signal differential voltage amplification	V_O =1 V to 4 V, R_L = 500 kΩ	25°C	150	315		V/mV
			Full range	100			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		
			Full range	15			
CMRR	Common-mode rejection ratio	V_O = 0, V_{IC} = V_{ICR}min, R_S = 50 Ω	25°C	75	110		dB
			Full range	75			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD}= 4.6 V to 16 V	25°C	80	110		dB
			Full range	80			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1.7	2.6	mA
			Full range			2.6	

† Full range is −40°C to +85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202I operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202I MIN	TLC2202I TYP	TLC2202I MAX	UNIT
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.6	2.5		V/μs
			Full range	1			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		nV/√Hz
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.9		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		47°		

† Full range is −40°C to +85°C.

TLC2202I electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AI			TLC2202BI			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		80	500		80	500	µV
			Full range			700			700	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			150			150	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			150			150	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50		0	50	mV
			Full range			50			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		150	315		V/mV
			Full range	100			100			
		V_O =1 V to 4 V, R_L = 10 kΩ	25°C	25	55		25	55		
			Full range	15			15			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min, V_O = 0, R_S = 50 Ω	25°C	75	110		75	110		dB
			Full range	75			75			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	80	110		80	110		dB
			Full range	80			80			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1.7	2.6		1.7	2.6	mA
			Full range			2.6			2.6	

† Full range is −40°C to +85°C

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202I operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AI			TLC2202BI			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.6	2.5		1.6	2.5		V/µs
			Full range	1			1			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/√Hz
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.9			1.9		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		47°			47°		

† Full range is −40°C to +85°C

NOTE 5: This parameter is tested on a sample basis for the TLC2202A and on all devices for the TLC2202B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2201M electrical characteristics at specified free-air temperature, $V_{DD\pm}$ = ±5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201M MIN	TLC2201M TYP	TLC2201M MAX	UNIT
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		100	500	µV
			Full range			700	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			500	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			500	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	R_L = 10 kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		V
			Full range	−4.7			
A_{VD}	Large-signal differential voltage amplification	V_O = ±4 V, R_L = 500 kΩ	25°C	400	560		V/mV
			Full range	200			
		V_O = ±4 V, R_L = 10 kΩ	25°C	90	100		
			Full range	45			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min, V_O = 0, R_S = 50 Ω	25°C	90	115		dB
			Full range	85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD\pm}$ = ±2.3 V to ±8 V	25°C	90	110		dB
			Full range	85			
I_{DD}	Supply current	V_O = 0, No load	25°C		1.1	1.5	mA
			Full range			1.5	

† Full range is −55°C to 125°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201M operating characteristics at specified free-air temperature, $V_{DD\pm}$ = ±5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201M MIN	TLC2201M TYP	TLC2201M MAX	UNIT
SR	Slew rate at unity gain	V_O = ±2.3 V, R_L = 10 kΩ, C_L = 100 pF	25°C	2	2.7		V/µs
			Full range	1.3			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		nV/√Hz
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.9		MHz
ϕ_m	Phase margin	R_L = 10 kΩ, C_L = 100 pF	25°C		48°		

† Full range is −55°C to 125°C.

TLC2201M electrical characteristics at specified free-air temperature, $V_{DD\pm}$ = ±5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AM			TLC2201BM			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		80	200		80	200	µV
			Full range			400			400	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			500			500	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			500			500	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	−5 to 2.7			−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	R_L = 10 kΩ	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		−4.7	−4.9		V
			Full range	−4.7			−4.7			
A_{VD}	Large-signal differential voltage amplification	V_O = ±4 V, R_L = 500 kΩ	25°C	400	560		400	560		V/mV
			Full range	200			200			
		V_O = ±4 V, R_L = 10 kΩ	25°C	90	100		90	100		
			Full range	45			45			
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR}min, V_O = 0, R_S = 50 Ω	25°C	90	115		90	115		dB
			Full range	85			85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD\pm}$ = ±2.3 V to ±8 V	25°C	90	110		90	110		dB
			Full range	85			85			
I_{DD}	Supply current	V_O = 0, No load	25°C		1.1	1.5		1.1	1.5	mA
			Full range			1.5			1.5	

† Full range is −55°C to 125°C.

NOTE 4: Typical values are based on the input offset voltage shift observable through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201M operating characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AM			TLC2201BM			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	$V_O = \pm2.3$ V, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C	2	2.7		2	2.7		V/μs
			Full range	1.3			1.3			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/√Hz
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C		1.9			1.9		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10$ kΩ, $C_L = 100$ pF	25°C		48°			48°		

† Full range is −55°C to 125°C.

NOTE 5: This parameter is tested on a sample basis for the TLC2201A and on all devices for the TLC2201B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2201M electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201M			UNIT
				MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		100	500	µV
			Full range			700	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005*	µV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			500	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			500	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50	mV
			Full range			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		V/mV
			Full range	75			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		
			Full range	10			
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR}min, V_O = 0, R_S = 50 Ω	25°C	90	110		dB
			Full range	85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	90	110		dB
			Full range	85			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1	1.5	mA
			Full range			1.5	

*On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C.
NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201M operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201M			UNIT
				MIN	TYP	MAX	
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.8	2.5		V/µs
			Full range	1.1			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		nV/√Hz
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.8		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		45°		

† Full range is −55°C to 125°C.

TLC2201M electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AM			TLC2201BM			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		80	200		80	200	μV
			Full range			400			400	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005		0.001	0.005	μV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			500			500	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			500			500	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50		0	50	V
			Full range			50			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		150	315		V/mV
			Full range	75			75			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		25	55		
			Full range	10			10			
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR}min, V_O = 0, R_S = 50 Ω	25°C	90	110		90	110		dB
			Full range	85			85			
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	90	110		90	110		dB
			Full range	85			85			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1.1	1.5		1.1	1.5	mA
			Full range			1.5			1.5	

† Full range is −55°C to 125°C.

NOTE 4: Typical values are based on the input offset voltage shift observable through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201M operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2201AM			TLC2201BM			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.8	2.5		1.8	2.5		V/μs
			Full range	1.1			1.1			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35		18	30	nV/√Hz
		f = 1 kHz	25°C		8	15		8	12	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.8			1.8		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		45°			45°		

† Full range is −55°C to 125°C.

NOTE 5: This parameter is tested on a sample basis for the TLC2201A and on all devices for the TLC2201B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2202M electrical characteristics at specified free-air temperature, $V_{DD\pm}$ = ±5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202M MIN	TLC2202M TYP	TLC2202M MAX	UNIT
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		100	1000	µV
			Full range			1250	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005	µV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			500	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			500	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	R_L = 10 kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		
			Full range	−4.7			V
A_{VD}	Large-signal differential voltage amplification	V_O =1 V to 4 V, R_L = 500 kΩ	25°C	300	560		V/mV
			Full range	100			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	50	100		
			Full range	25			
CMRR	Common-mode rejection ratio	V_O = 0, $V_{IC} = V_{ICR}$min, R_S = 50 Ω	25°C	80	115		dB
			Full range	80			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD}= ±2.3 V to ±8 V	25°C	80	110		dB
			Full range	80			
I_{DD}	Supply current	V_O = 0, No load	25°C		1.8	2.7	mA
			Full range			2.7	

* On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C.
NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202M operating characteristics at specified free-air temperature, $V_{DD\pm}$ = ±5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202M MIN	TLC2202M TYP	TLC2202M MAX	UNIT
SR	Slew rate at unity gain	V_O = ±2.3 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.8	2.7		V/µs
			Full range	1.1			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		nV/√Hz
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.9		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		48°		

† Full range is −55°C to 125°C.

TLC2202M electrical characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AM MIN	TLC2202AM TYP	TLC2202AM MAX	TLC2202BM MIN	TLC2202BM TYP	TLC2202BM MAX	UNIT
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$	25°C		80	500		80	500	µV
			Full range			750			750	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005*		0.001	0.005*	µV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			500			500	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			500			500	
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$	Full range	−5 to 2.7			−5 to 2.7			V
V_{OM+}	Maximum positive peak output voltage swing	$R_L = 10\ k\Omega$	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OM-}	Maximum negative peak output voltage swing		25°C	−4.7	−4.9		−4.7	−4.9		V
			Full range	−4.7			−4.7			
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm4$ V, $R_L = 500\ k\Omega$	25°C	300	560		300	560		V/mV
			Full range	100			100			
		$V_O = \pm4$ V, $R_L = 10\ k\Omega$	25°C	50	100		50	100		
			Full range	25			25			
CMRR	Common-mode rejection ratio	$V_O = 0$, $V_{IC} = V_{ICR}$min, $R_S = 50\ \Omega$	25°C	80	115		80	115		dB
			Full range	80			80			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD\pm} = \pm2.3$ V to ±8 V	25°C	80	110		80	110		dB
			Full range	80			80			
I_{DD}	Supply current	$V_O = 0$, No load	25°C		1.8	2.7		1.8	2.7	mA
			Full range			2.7			2.7	

* On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.

† Full range is −55°C to 125°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150°C$ extrapolated to $T_A = 25°C$ using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202M operating characteristics at specified free-air temperature, $V_{DD\pm} = \pm5$ V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AM			TLC2202BM			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	$V_O = \pm2.3$ V, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C	1.8	2.7		1.8	2.7		V/µs
			Full range	1.1			1.1			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35*		18	30*	nV/√Hz
		f = 1 kHz	25°C		8	15*		8	12*	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		µV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, $R_L = 10$ kΩ, $C_L = 100$ pF	25°C		1.9			1.9		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10$ kΩ, $C_L = 100$ pF	25°C		48°			48°		

*On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C.
NOTE 5: This parameter is tested on a sample basis for the TLC2202A and on all devices for the TLC2202B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2202M electrical characteristics at specified free-air temperatures, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202M			UNIT
				MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		100	1000	μV
			Full range			1250	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005*	μV/mo
I_{IO}	Input offset current		25°C		0.5	60	pA
			Full range			500	
I_{IB}	Input bias current		25°C		1	60	pA
			Full range			500	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		V
			Full range	4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50	mV
			Full range			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		V/mV
			Full range	75			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		
			Full range	10			
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR}min, R_S = 50 Ω	25°C	75	110		dB
			Full range	75			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	80	110		dB
			Full range	80			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1.7	2.6	mA
			Full range			2.6	

*On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C.
NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202M operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202M			UNIT
				MIN	TYP	MAX	
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.6	2.5		V/μs
			Full range	0.9			
V_n	Equivalent input noise voltage	f = 10 Hz	25°C		18		$nV/\sqrt{Hz}$
		f = 1 kHz	25°C		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7		
I_n	Equivalent input noise current		25°C		0.6		$fA/\sqrt{Hz}$
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.9		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		47°		

† Full range is −55°C to 125°C.

TLC2202M electrical characteristics at specified free-air temperature, V_{DD} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AM MIN	TLC2202AM TYP	TLC2202AM MAX	TLC2202BM MIN	TLC2202BM TYP	TLC2202BM MAX	UNIT
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		80	500		80	500	µV
			Full range			750			750	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.5			0.5		µV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.001	0.005*		0.001	0.005*	µV/mo
I_{IO}	Input offset current		25°C		0.5	60		0.5	60	pA
			Full range			500			500	
I_{IB}	Input bias current		25°C		1	60		1	60	pA
			Full range			500			500	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	0 to 2.7			0 to 2.7			V
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ	25°C	4.7	4.8		4.7	4.8		V
			Full range	4.7			4.7			
V_{OL}	Maximum low-level output voltage	I_O = 0	25°C		0	50		0	50	mV
			Full range			50			50	
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V, R_L = 500 kΩ	25°C	150	315		150	315		V/mV
			Full range	75			75			
		V_O = 1 V to 4 V, R_L = 10 kΩ	25°C	25	55		25	55		
			Full range	10			10			
CMRR	Common-mode rejection ratio	V_O = 0, $V_{IC} = V_{ICR}$min, R_S = 50 Ω	25°C	75	110		75	110		dB
			Full range	75			75			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	V_{DD} = 4.6 V to 16 V	25°C	80	110		80	110		dB
			Full range	80			80			
I_{DD}	Supply current	V_O = 2.5 V, No load	25°C		1.7	2.6		1.7	2.6	mA
			Full range			2.6			2.6	

* On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202M operating characteristics at specified free-air temperature, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	T_A†	TLC2202AM			TLC2202BM			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	V_O = 0.5 V to 2.5 V, R_L = 10 kΩ, C_L = 100 pF	25°C	1.6	2.5		1.6	2.5		V/μs
			Full range	0.9			1.1			
V_n	Equivalent input noise voltage (see Note 5)	f = 10 Hz	25°C		18	35*		18	30*	nV/√Hz
		f = 1 kHz	25°C		8	15*		8	12*	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5			0.5		μV
		f = 0.1 to 10 Hz	25°C		0.7			0.7		
I_n	Equivalent input noise current		25°C		0.6			0.6		fA/√Hz
	Gain-bandwidth product	f = 10 kHz, R_L = 10 kΩ, C_L = 100 pF	25°C		1.9			1.9		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ, C_L = 100 pF	25°C		47°			47°		

* On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C
NOTE 5: This parameter is tested on a sample basis for the TLC2202A and on all devices for the TLC2202B. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

TLC2201Y electrical characteristics at $V_{DD\pm} = \pm5$ V, $T_A = 25°C$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	TLC2201Y MIN	TLC2201Y TYP	TLC2201Y MAX	UNIT
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$		100		µV
	Input offset voltage long-term drift (see Note 4)	$V_{IC} = 0$, $R_S = 50\ \Omega$		0.001		µV/mo
I_{IO}	Input offset current	$V_{IC} = 0$, $R_S = 50\ \Omega$		0.5		pA
I_{IB}	Input bias current	$V_{IC} = 0$, $R_S = 50\ \Omega$		1		pA
V_{OH}	Maximum high-level output voltage	$R_L = 10\ k\Omega$		4.8		V
V_{OL}	Maximum low-level output voltage	$I_O = 0$		0		mV
A_{VD}	Large-signal differential voltage amplification	$V_O = 1$ V to 4 V, $R_L = 500\ \Omega$		55		V/mV
		$V_O = 1$ V to 4 V, $R_L = 10\ \Omega$		55		
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$		110		dB
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{DD\pm}/\Delta V_{IO}$)	$V_{DD} = 4.6$ to 16 V		110		dB
I_{DD}	Supply current per amplifier	$V_O = 2.5$ V, No load		1		mA

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150°C$ extrapolated to $T_A = 25°C$ using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2201Y operating characteristics at $V_{DD\pm} = \pm5$ V, $T_A = 25°C$

PARAMETER		TEST CONDITIONS	TLC2201Y MIN	TLC2201Y TYP	TLC2201Y MAX	UNIT
SR	Positive slew rate at unity gain	$V_O = \pm0.5$ to 2.5 V, $R_L = 10\ k\Omega$, $C_L = 100$ pF		2.5		V/µs
V_n	Equivalent input noise voltage	f = 10 Hz		18		$nV/\sqrt{Hz}$
		f = 1 kHz		8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz		0.5		µV
		f = 0.1 to 10 Hz		0.7		
I_n	Equivalent input noise current			0.6		$pA/\sqrt{Hz}$
	Gain-bandwidth product	f = 10 kHz, $R_L = 10\ k\Omega$, $C_L = 100$ pF		1.8		MHz
ϕ_m	Phase margin at unity gain	$R_L = 10\ k\Omega$, $C_L = 100$ pF		48°		

TLC2202Y electrical characteristics, V_{DD} = 5 V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS		TLC2202Y			UNIT
				MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0,	R_S = 50 Ω		100		µV
	Input offset voltage long-term drift (see Note 4)	V_{IC} = 0,	R_S = 50 Ω		0.001		µV/mo
I_{IO}	Input offset current	V_{IC} = 0,	R_S = 50 Ω		0.5		pA
I_{IB}	Input bias current	V_{IC} = 0,	R_S = 50 Ω		1		pA
V_{OH}	Maximum high-level output voltage	R_L = 10 kΩ			4.8		V
V_{OL}	Maximum low-level output voltage	I_O = 0			0		mV
A_{VD}	Large-signal differential voltage amplification	V_O = 1 V to 4 V,	R_L = 500 Ω		315		V/mV
		V_O = 1 V to 4 V,	R_L = 10 Ω		55		
CMRR	Common-mode rejection ratio	V_O = 0, V_{ICR}min,	R_S = 50 Ω		110		dB
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{DCC}/\Delta V_{IO}$)	V_{DD} = 4.6 to 16 V			110		dB
I_{DD}	Supply current	V_O = 2.5 V,	No load		1.7		mA

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150°C extrapolated to T_A = 25°C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLC2202Y operating characteristics at V_{DD} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		TLC2202Y			UNIT
				MIN	TYP	MAX	
SR	Positive slew rate at unity gain	V_O = 0.5 V to 2.5 V, C_L = 100 pF	R_L = 10 kΩ,		2.5		V/µs
V_n	Equivalent input noise voltage	f = 10 Hz			18		nV/√Hz
		f = 10 kHz			8		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz			0.5		µV
		f = 0.1 to 10 Hz			0.7		
I_n	Equivalent input noise current				0.6		pA/√Hz
B_1	Gain-bandwidth product	f = 10 kHz, C_L = 100 pF	R_L = 10 kΩ,		1.9		MHz
ϕ_m	Phase margin at unity gain	R_L = 10 kΩ,	C_L = 100 pF		47°		

PARAMETER MEASUREMENT INFORMATION

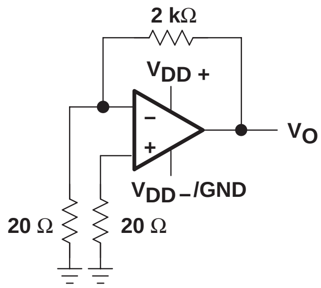
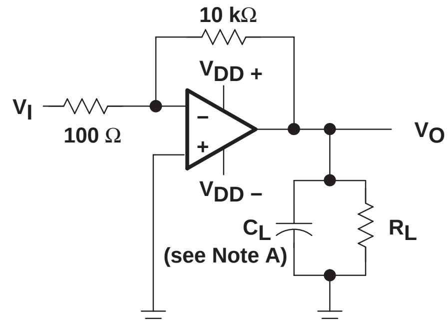
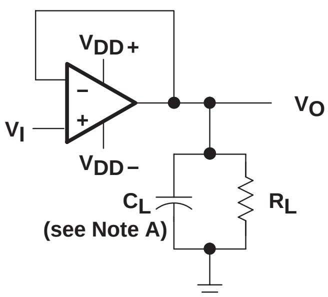


Figure 1. Noise-Voltage Test Circuit



NOTE A: C_L includes fixture capacitance.

Figure 2. Phase-Margin Test Circuit



NOTE A: C_L includes fixture capacitance.

Figure 3. Slew-Rate Test Circuit

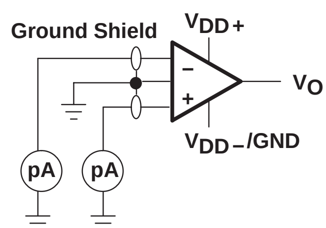


Figure 4. Input-Bias and Offset-Current Test Circuit

typical values

Typical values presented in this data sheet represent the median (50% point) of device parametric performance.

input bias and offset current

At the picoamp bias current level of the TLC220x, TLC220xA, and TLC220xB, accurate measurement of the bias current becomes difficult. Not only does this measurement require a picoammeter, but test socket leakages can easily exceed the actual device bias currents. To measure these small currents, Texas Instruments uses a two-step process. The socket leakage is measured using picoammeters with bias voltages applied but with no device in the socket. The device is then inserted in the socket, and a second test measuring both the socket leakage and the device input bias current is performed. The two measurements are then subtracted algebraically to determine the bias current of the device.

noise

Texas Instruments offers automated production noise testing to meet individual application requirements. Noise voltage at f = 10 Hz and f = 1 kHz is 100% tested on every TLC2201B device, while lot sample testing is performed on the TLC220xA. For other noise requirements, please contact the factory.

TYPICAL CHARACTERISTICS

Table of Graphs

			FIGURE
V_{IO}	Input offset voltage	Distribution	5, 6
I_{IB}	Input bias current	vs Common-mode input voltage vs Free-air temperature	7 8
V_{OM}	Maximum peak output voltage	vs Output current vs Free-air temperature	9 10
$V_{O(PP)}$	Maximum peak-to-peak output voltage	vs Frequency	11
V_{OH}	High-level output voltage	vs Frequency vs High-level output current vs Free-air temperature	12 13 14
V_{OL}	Low-level output voltage	vs Low-level output current vs Free-air temperature	15 16
A_{VD}	Large-signal differential voltage amplification	vs Frequency vs Free-air temperature	17 18
I_{OS}	Short-circuit output current	vs Supply voltage vs Free-air temperature	19 20
CMRR	Common-mode rejection ratio	vs Frequency	21
I_{DD}	Supply current	vs Supply voltage vs Free-air temperature	22 23, 24
	Pulse response	Small signal Large signal	25, 26 27, 28
SR	Slew rate	vs Supply voltage vs Free-air temperature	29 30
	Noise voltage (referred to input)	0.1 to 1 Hz 0.1 to 10 Hz	31 32
	Gain-bandwidth product	vs Supply voltage vs Free-air temperature	33, 34 35
ϕ_m	Phase margin	vs Supply voltage vs Free-air temperature	36, 37 38, 39
	Phase shift	vs Frequency	17

TYPICAL CHARACTERISTICS

DISTRIBUTION OF TLC2201
INPUT OFFSET VOLTAGE

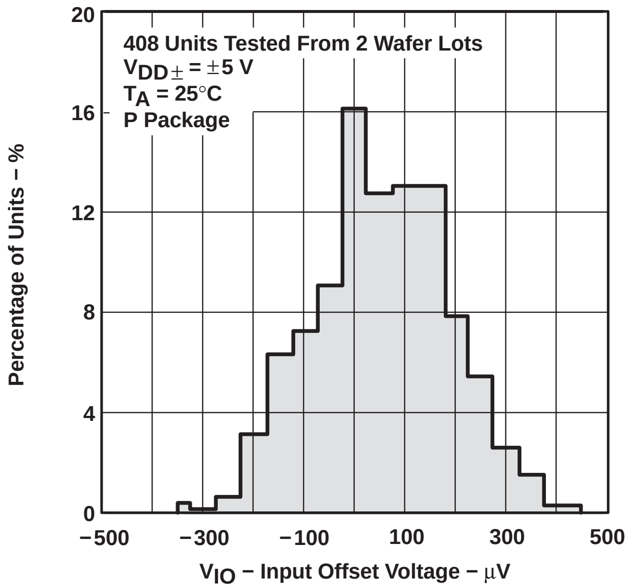


Figure 5

TLC2202
DISTRIBUTION OF
INPUT OFFSET VOLTAGE

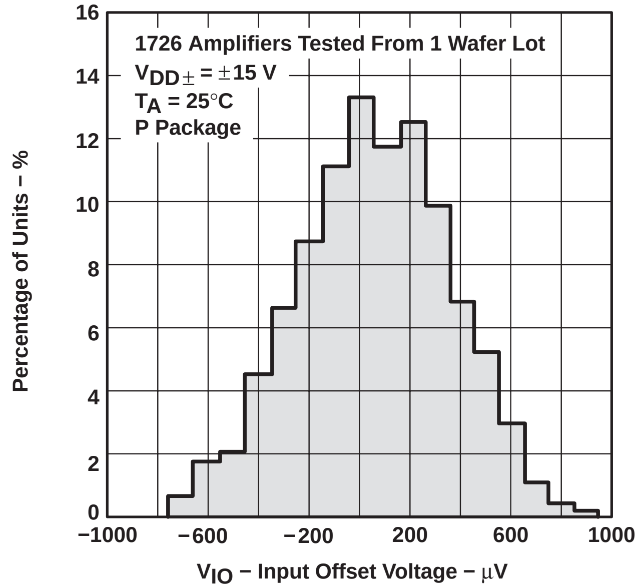


Figure 6

INPUT BIAS CURRENT
vs
COMMON-MODE INPUT VOLTAGE

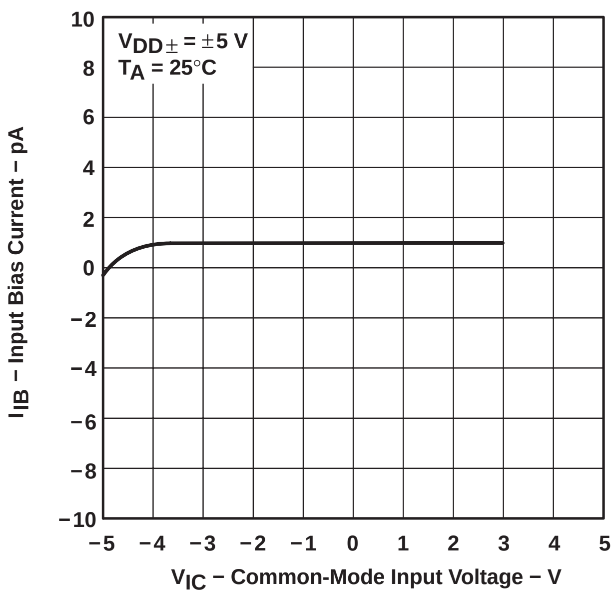


Figure 7

INPUT BIAS CURRENT†
vs
FREE-AIR TEMPERATURE

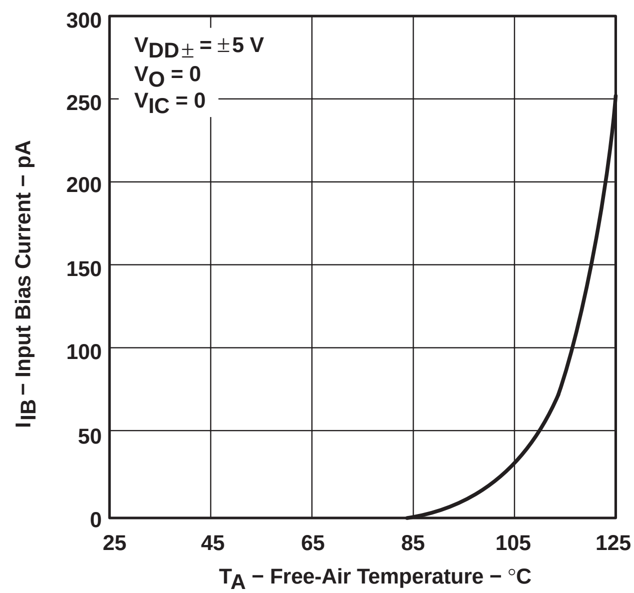


Figure 8

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

MAXIMUM PEAK OUTPUT VOLTAGE vs OUTPUT CURRENT

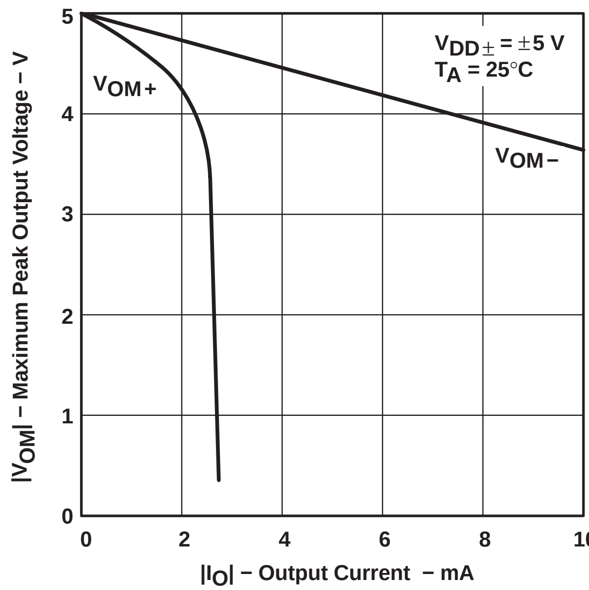


Figure 9

MAXIMUM PEAK OUTPUT VOLTAGE† vs FREE-AIR TEMPERATURE

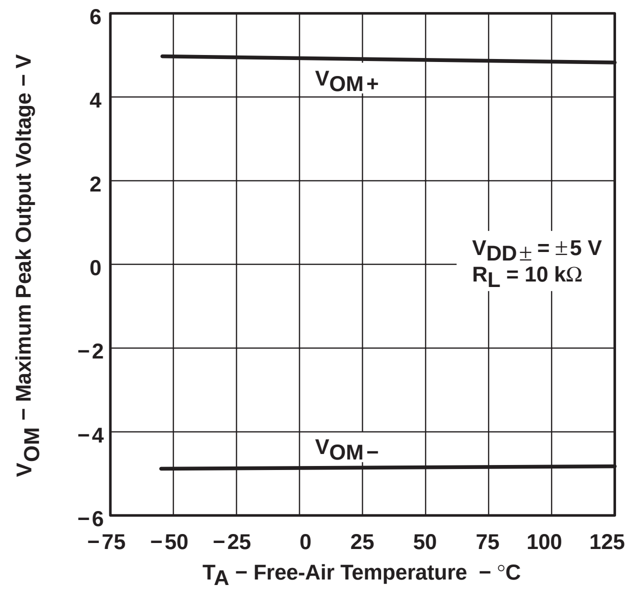


Figure 10

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE† vs FREQUENCY

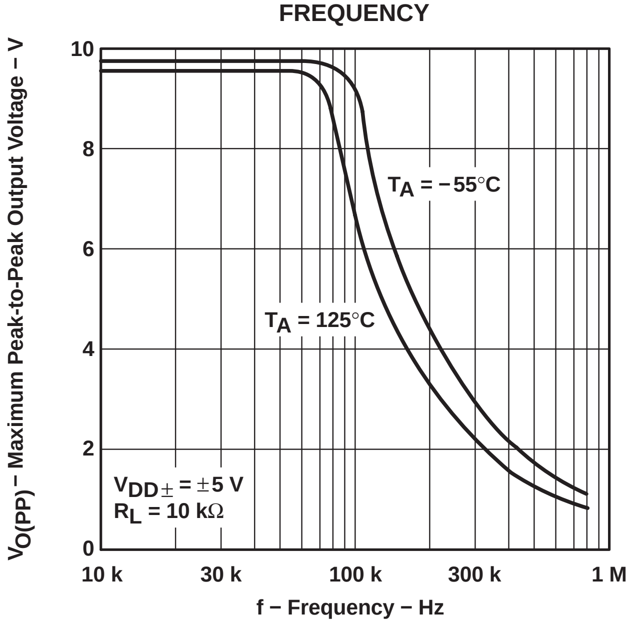


Figure 11

HIGH-LEVEL OUTPUT VOLTAGE† vs FREQUENCY

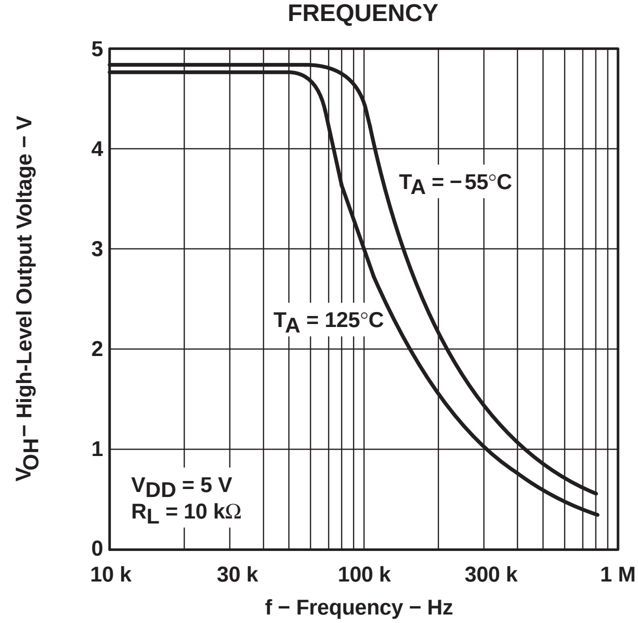


Figure 12

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

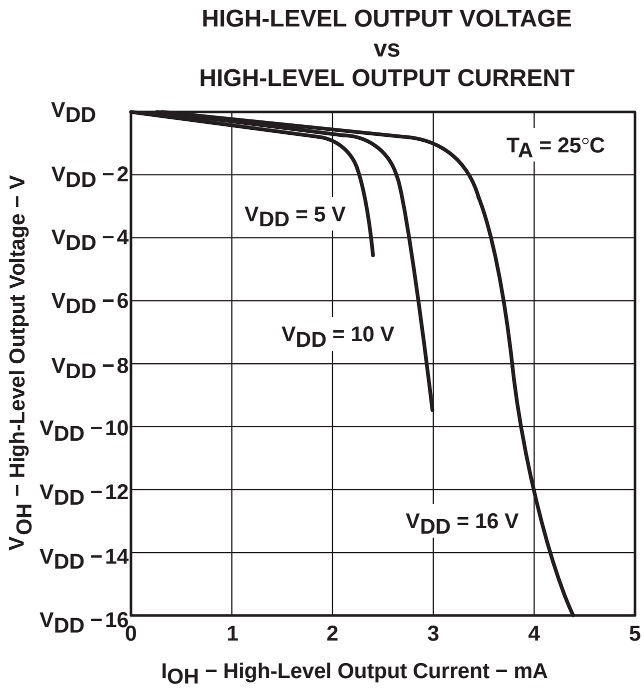


Figure 13

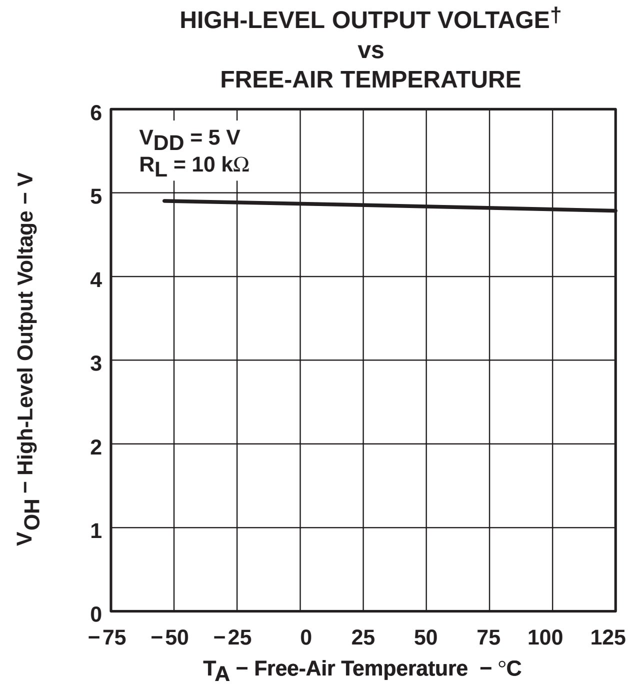


Figure 14

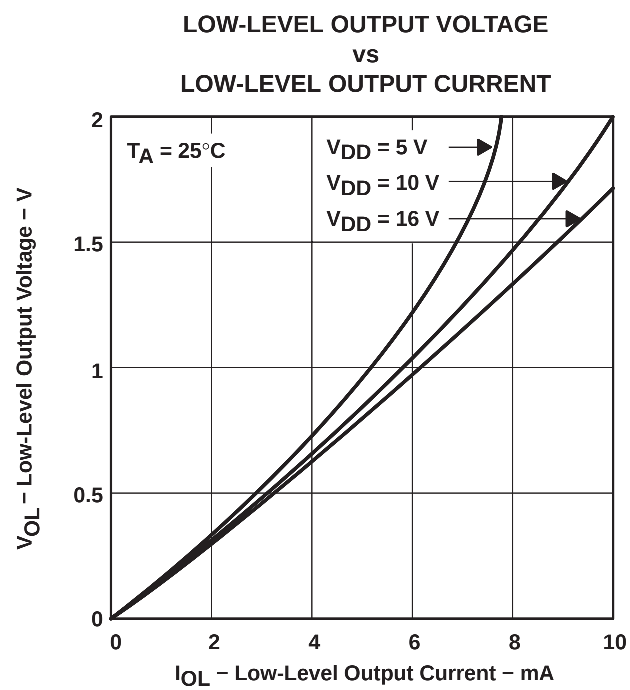


Figure 15

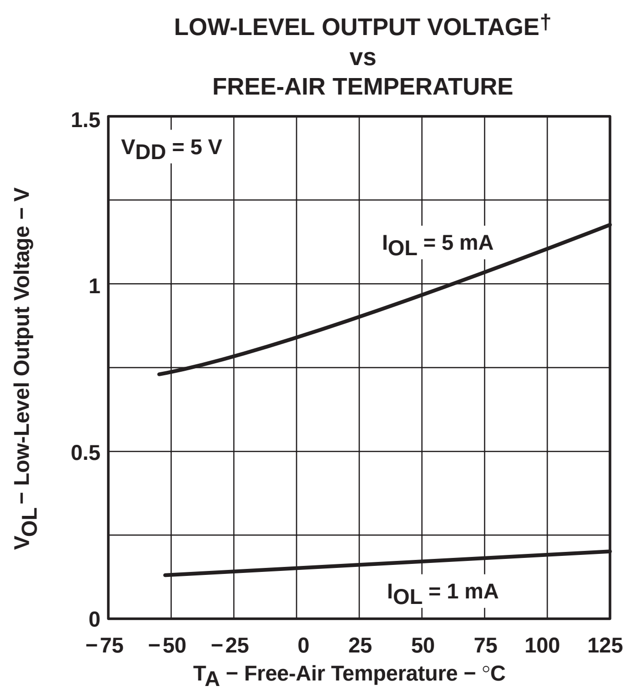


Figure 16

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT vs FREQUENCY

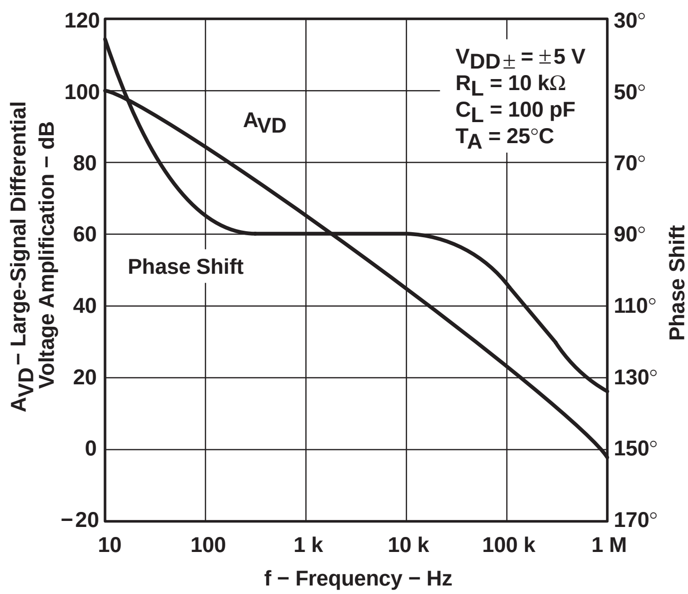


Figure 17

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION† vs FREE-AIR TEMPERATURE

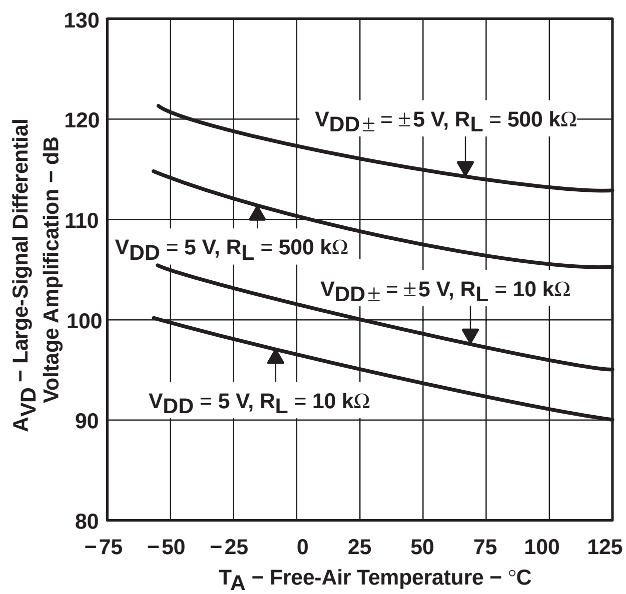


Figure 18

SHORT-CIRCUIT OUTPUT CURRENT vs SUPPLY VOLTAGE

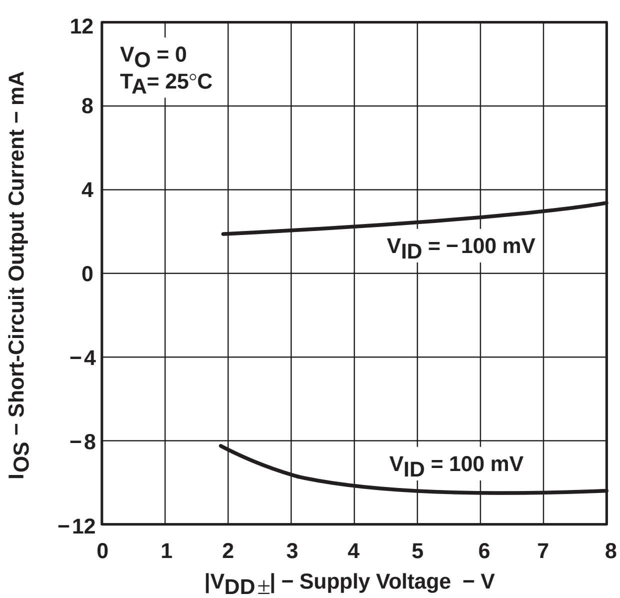


Figure 19

SHORT-CIRCUIT OUTPUT CURRENT† vs FREE-AIR TEMPERATURE

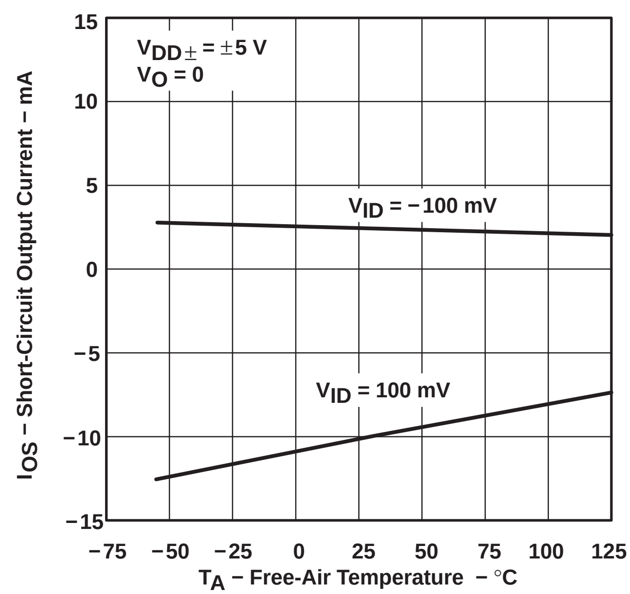


Figure 20

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

COMMON-MODE REJECTION RATIO
vs
FREQUENCY

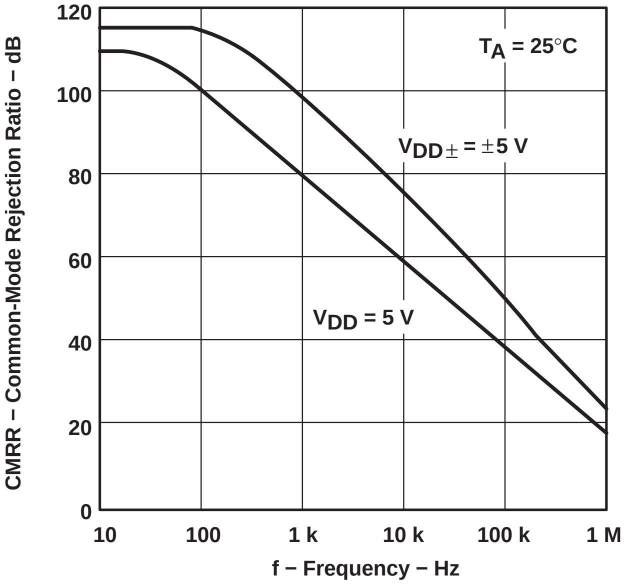


Figure 21

SUPPLY CURRENT†
vs
SUPPLY VOLTAGE

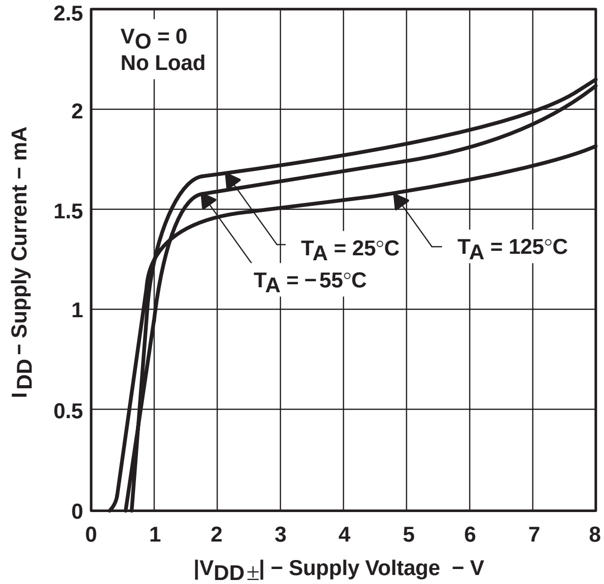


Figure 22

TLC2201
SUPPLY CURRENT†
vs
FREE-AIR TEMPERATURE

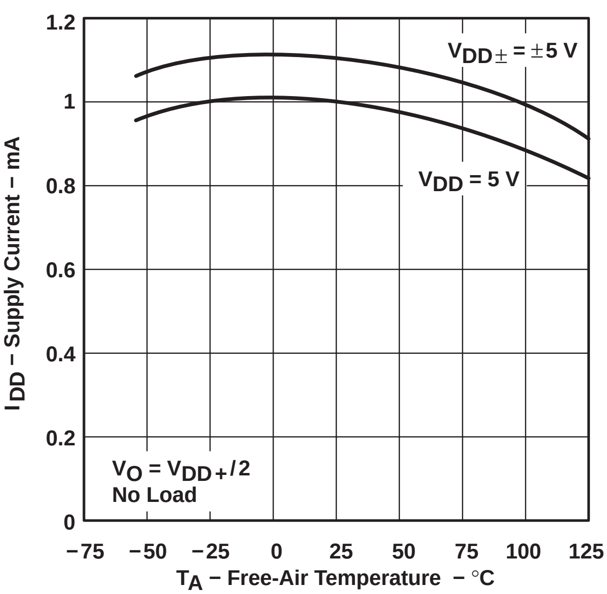


Figure 23

TLC2202
SUPPLY CURRENT†
vs
FREE-AIR TEMPERATURE

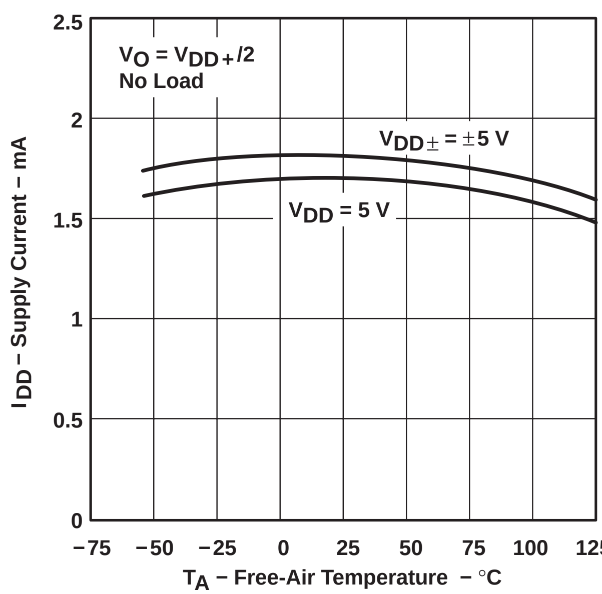


Figure 24

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

VOLTAGE-FOLLOWER
SMALL-SIGNAL
PULSE RESPONSE

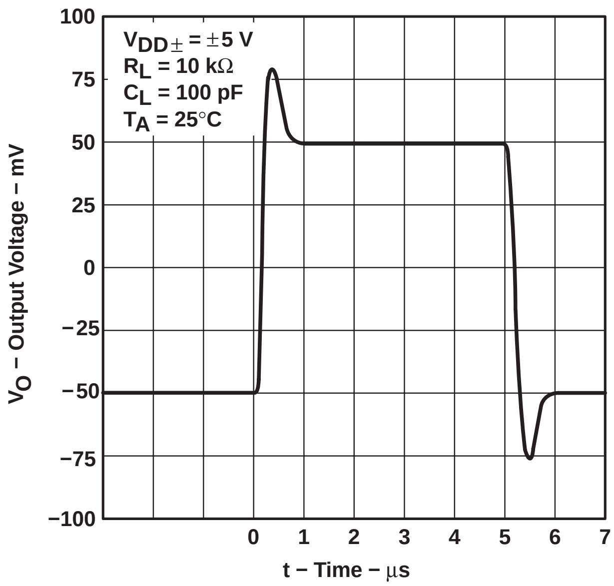


Figure 25

VOLTAGE-FOLLOWER
SMALL-SIGNAL
PULSE RESPONSE

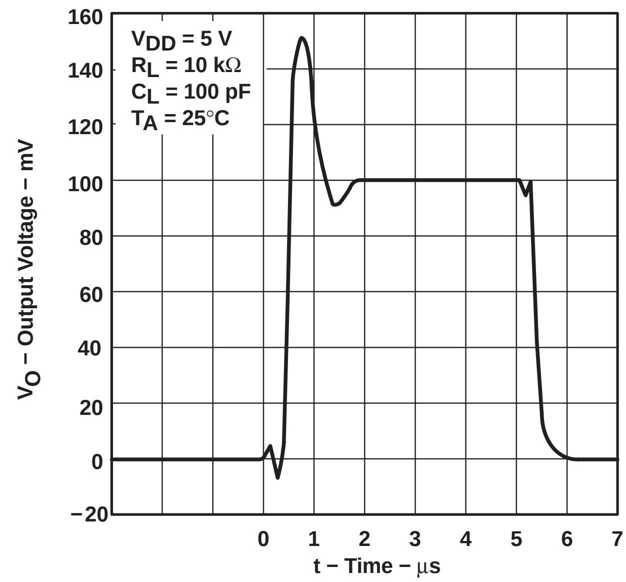


Figure 26

VOLTAGE-FOLLOWER
LARGE-SIGNAL
PULSE RESPONSE

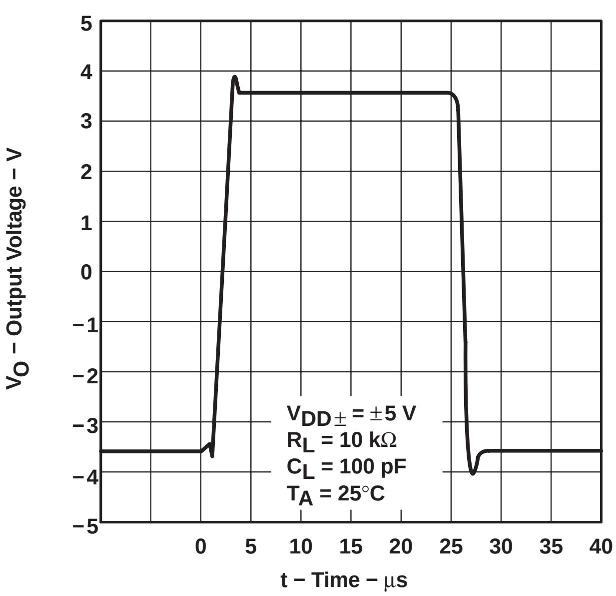


Figure 27

VOLTAGE-FOLLOWER
LARGE-SIGNAL
PULSE RESPONSE

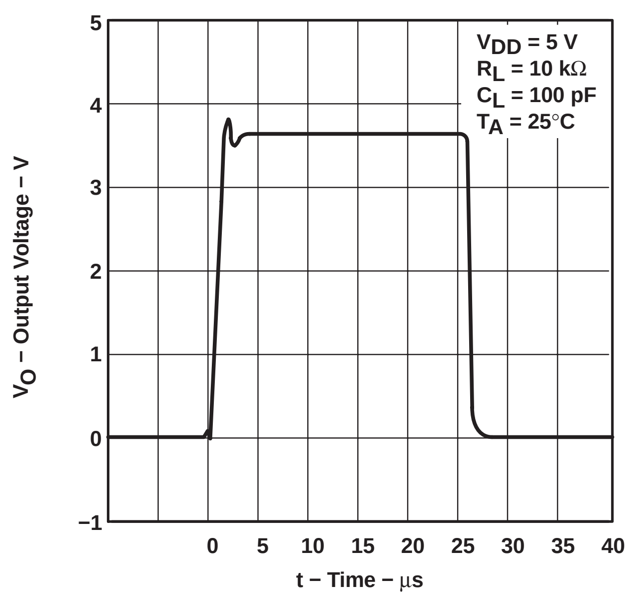


Figure 28

TYPICAL CHARACTERISTICS

SLEW RATE
vs
SUPPLY VOLTAGE

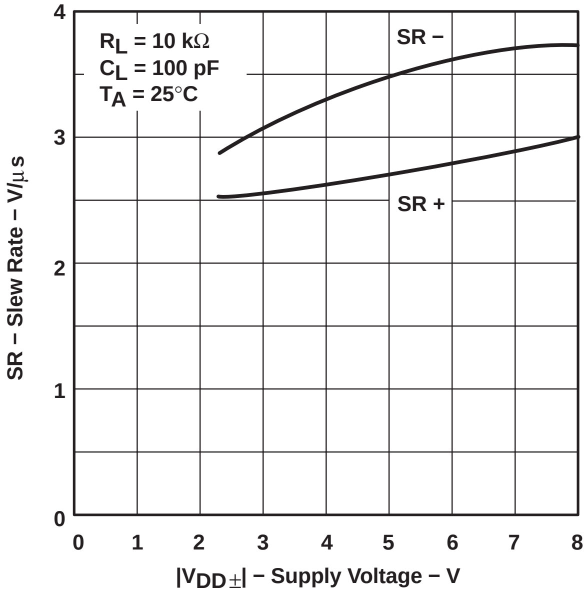


Figure 29

SLEW RATE†
vs
FREE-AIR TEMPERATURE

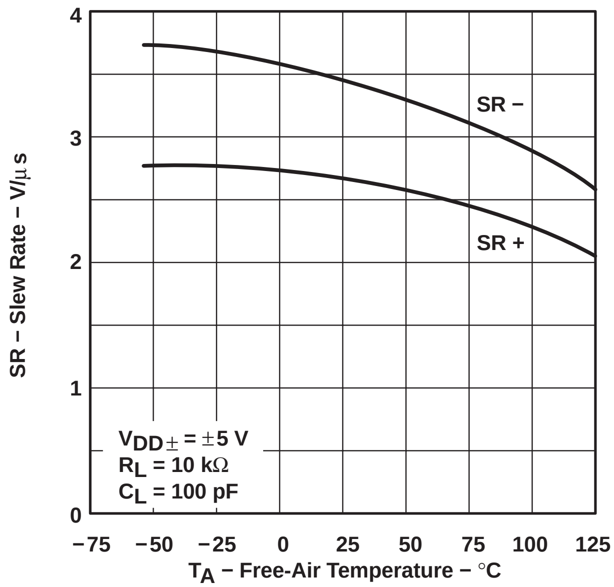


Figure 30

NOISE VOLTAGE
(REFERRED TO INPUT)
OVER A 10-SECOND INTERVAL

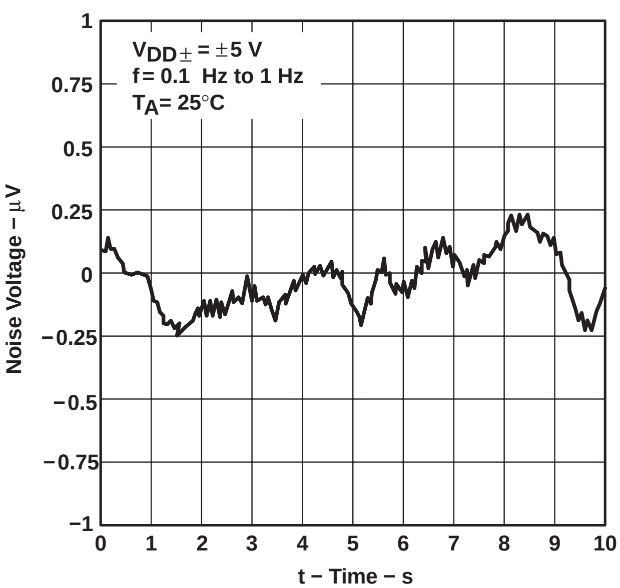


Figure 31

NOISE VOLTAGE
(REFERRED TO INPUT)
OVER A 10-SECOND INTERVAL

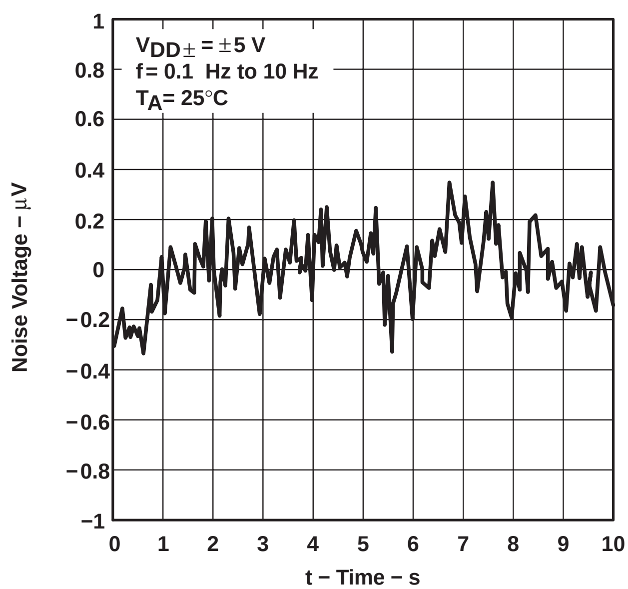


Figure 32

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

**TLC2201
GAIN-BANDWIDTH PRODUCT
vs
SUPPLY VOLTAGE**

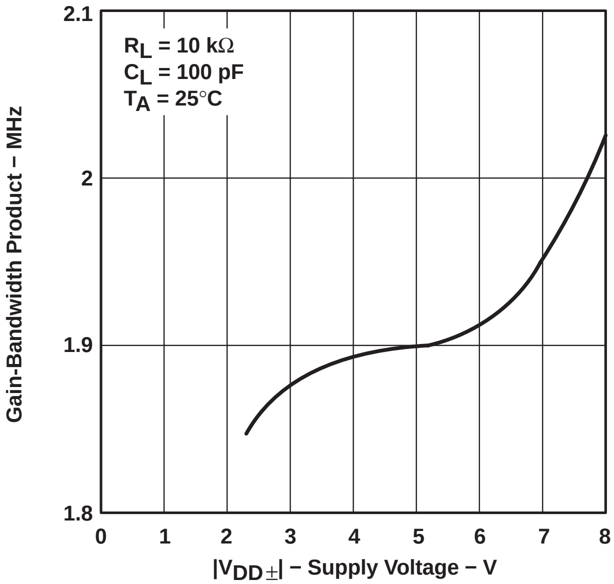


Figure 33

**TLC2202
GAIN-BANDWIDTH PRODUCT
vs
SUPPLY VOLTAGE**

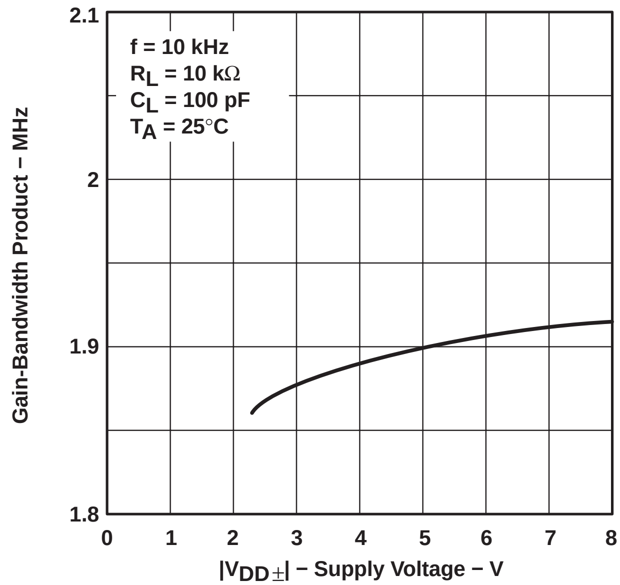


Figure 34

**GAIN-BANDWIDTH PRODUCT†
vs
FREE-AIR TEMPERATURE**

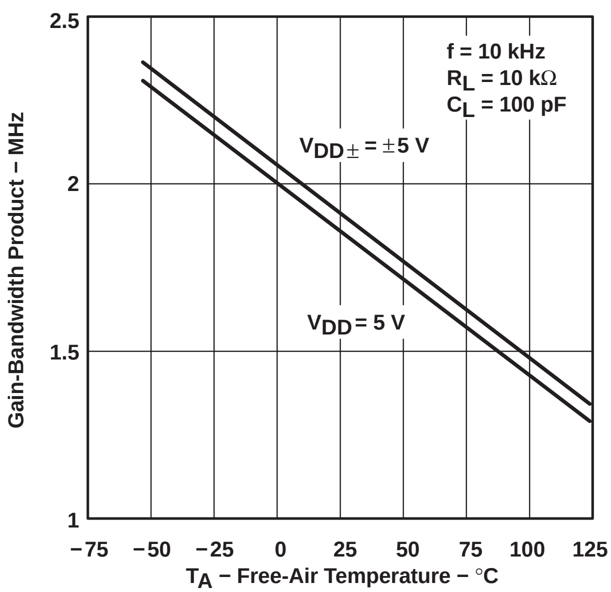


Figure 35

**TLC2201
PHASE MARGIN
vs
SUPPLY VOLTAGE**

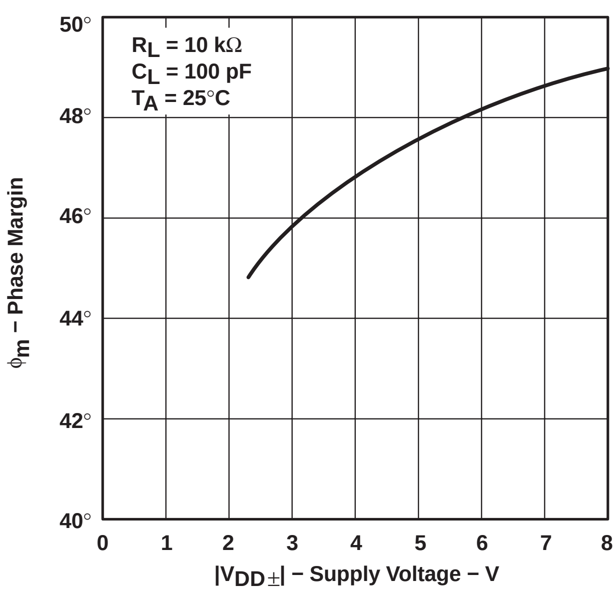


Figure 36

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

TLC2202
PHASE MARGIN
vs
SUPPLY VOLTAGE

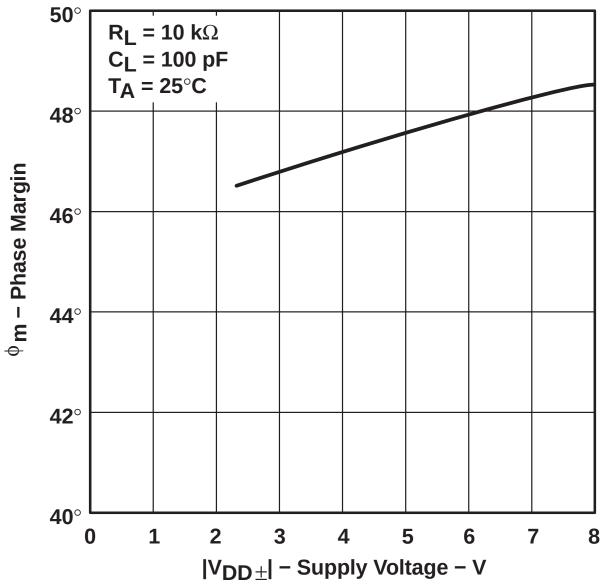


Figure 37

TLC2201
PHASE MARGIN†
vs
FREE-AIR TEMPERATURE

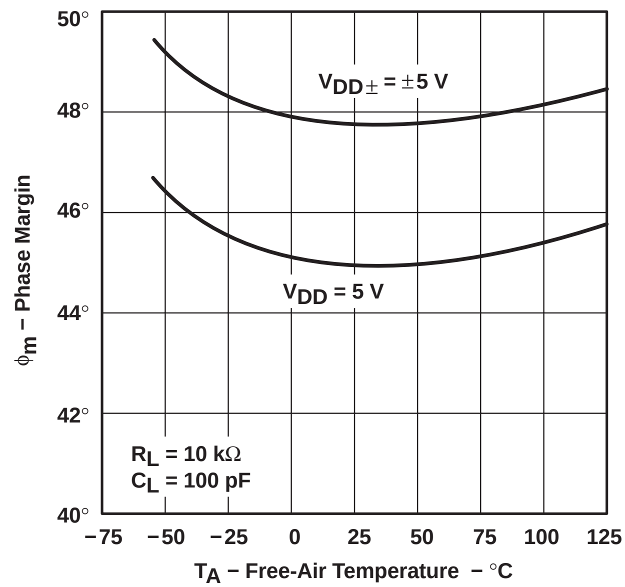


Figure 38

TLC2202
PHASE MARGIN†
vs
FREE-AIR TEMPERATURE

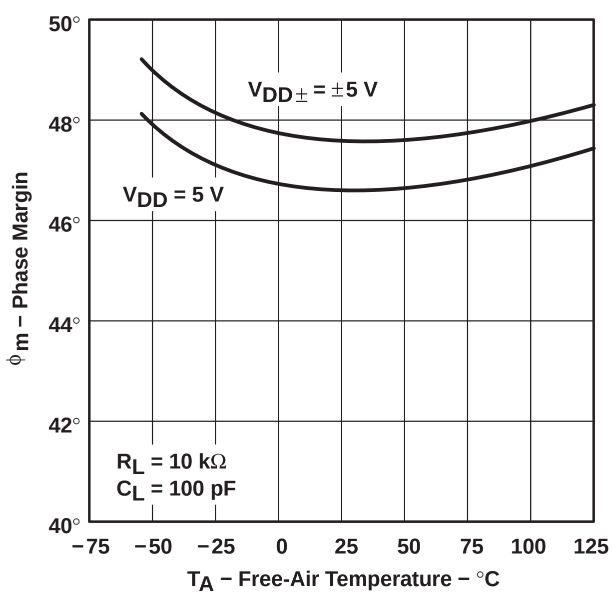


Figure 39

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

APPLICATION INFORMATION

latch-up avoidance

Because CMOS devices are susceptible to latch-up due to their inherent parasitic thyristors, the TLC220x, TLC220xA, and TLC220xB inputs and outputs are designed to withstand −100-mA surge currents without sustaining latch-up; however, techniques reducing the chance of latch-up should be used whenever possible. Internal protection diodes should not be forward biased in normal operation. Applied input and output voltages should not exceed the supply voltage by more than 300 mV. Care should be exercised when using capacitive coupling on pulse generators. Supply transients should be shunted by the use of decoupling capacitors (0.1 μF typical) located across the supply rails as close to the device as possible.

electrostatic discharge protection

These devices use internal ESD-protection circuits that prevent functional failures at voltages at or below 2000 V. Care should be exercised in handling these devices as exposure to ESD may result in degradation of the device parametric performance.

macromodel information

Macromodel information provided was derived using Microsim *Parts*™, the model generation software used with Microsim *PSpice*™. The Boyle macromodel (see Note 5) and subcircuit in Figure 40 were generated using the TLC220x typical electrical and operating characteristics at 25°C. Using this information, output simulations of the following key parameters can be generated to a tolerance of 20% (in most cases):

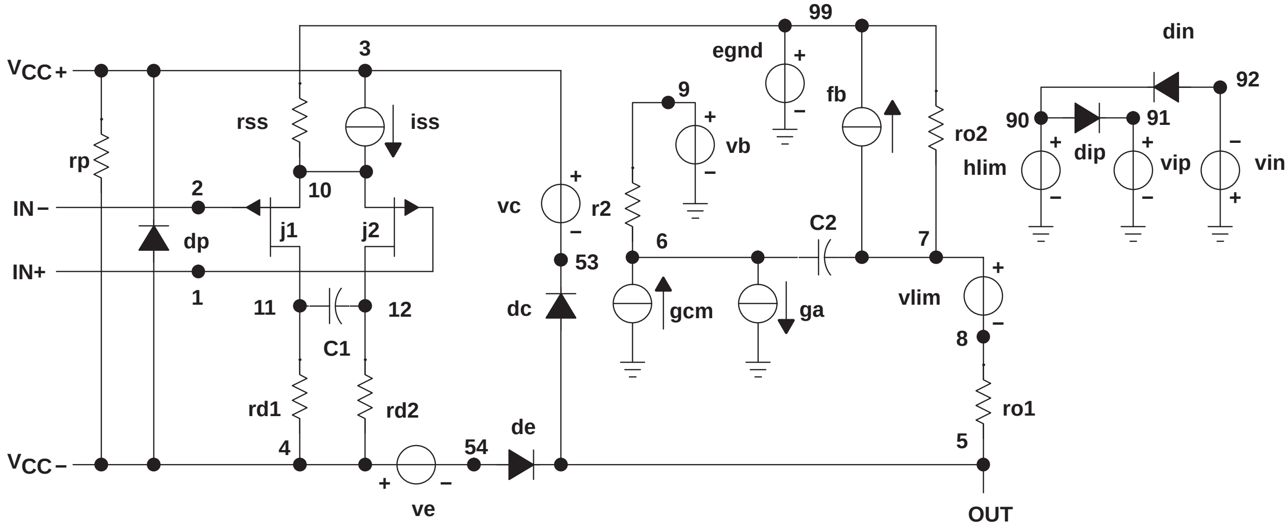
- Maximum positive output voltage swing
- Maximum negative output voltage swing
- Slew rate
- Quiescent power dissipation
- Input bias current
- Open-loop voltage amplification
- Unity-gain frequency
- Common-mode rejection ratio
- Phase margin
- DC output resistance
- AC output resistance
- Short-circuit output current limit

NOTE 5: G. R. Boyle, B. M. Cohn, D. O. Pederson, and J. E. Solomon, “Macromodeling of Integrated Circuit Operational Amplifiers”, *IEEE Journal of Solid-State Circuits*, SC-9, 353 (1974).

PSpice and *Parts* are trademarks of MicroSim Corporation.

APPLICATION INFORMATION

macromodel information (continued)




```
.subckt TLC220x  1 2 3 4 5
*
  c1   11  12  8.51E-12
  c2   6   7   50.00E-12
  cpsr 85  86  79.6E-9
  dcm+ 81  82  dx
  dcm- 83  81  dx
  dc   5   53  dx
  de   54  5   dx
  dlp  90  91  dx
  dln  92  90  dx
  dp   4   3   dx
  ecmr 84  99  (2,99) 1
  egnd 99  0   poly(2) (3,0) (4,0) 0 .5 .5
  epsr 85  0   poly(1) (3,4) -200E-6 20E-6
  ense 89  2   poly(1) (88,0) 100E-6 1
  fb   7   99  poly(6) vb vc ve vlp vln
+  vpsr 0 +    895.9E3 -90E3 90E3 90E3 -90E3 895E3
  ga   6   0   11 12 314.2E-6
  gcm  0   6   10 99 1.295E-9
  gpsr 85  86  (85,86) 100E-6
  grd1 60  11  (60,11) 3.141E-4
  grd2 60  12  (60,12) 3.141E-4
  hlim 90  0   vlim 1k
  hcmr 80  1   poly(2) vcm+ vcm- 0 1E2 1E2
  irp  3   4   965E-6
  iss  3   10  dc 135.0E-6
  iio  2   0   .5E-12
  i1   88  0   1E-21
  j1   11  89  10 jx
  j2   12  80  10 jx
  r2   6   9   100.0E3
  rcm  84  81  1k
  rn1  88  0   1500
  ro1  8   5   188
  ro2  7   99  187
  rss  10  99  1.481E6
  vad  60  4   -.3v
  vcm+ 82  99  2.2
  vcm- 83  99  -4.5
  vb   9   0   dc 0
  vc   3   53  dc .9
  ve   54  4   dc .8
  vlim 7   8   dc 0
  vlp  91  0   dc 2.8
  vln  0   92  dc 2.8
  vpsr 0   86  dc 0
.model dx  d(is=800.0E-18)
.model jx pjf(is=500.0E-15 beta=1.462E-3
+ vto=-.155 kf=1E-17)
.endsx
```

Figure 40. Boyle Macromodel and Subcircuit

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
5962-9088201M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9088201MPA	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9088202M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9088202MPA	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9088203Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9088203QPA	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9088204Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9088204QPA	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLC2201AMD	ACTIVE	SOIC	D	8	75	TBD	CU NIPDAU	Level-1-220C-UNLIM
TLC2201AMDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2201AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
TLC2201AMJG	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLC2201AMJGB	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLC2201AMP	OBSOLETE	PDIP	P	8		TBD	Call TI	Call TI
TLC2201CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2201CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2201CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2201CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2201CP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLC2201CPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLC2201CPSR	OBSOLETE	SO	PS	8		TBD	Call TI	Call TI
TLC2201ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2201IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2201IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2201IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2201IP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLC2201IPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLC2201MFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
TLC2201MJG	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLC2201MJGB	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLC2202AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
TLC2202AMJG	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLC2202AMJGB	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
TLC2202CD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2202CDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2202CDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2202CDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2202CP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLC2202CPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLC2202CPSR	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2202CPSRG4	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2202ID	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2202IDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLC2202IP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLC2202IPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLC2202MFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
TLC2202MJG	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLC2202MJGB	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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OTHER QUALIFIED VERSIONS OF TLC2201, TLC2201AM, TLC2201M, TLC2202, TLC2202AM, TLC2202M :

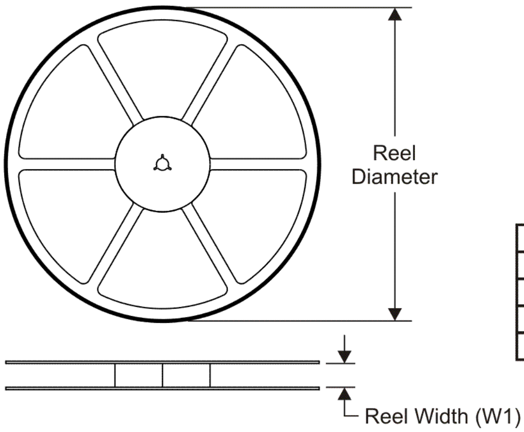
- Catalog: TLC2201A, TLC2202A

NOTE: Qualified Version Definitions:

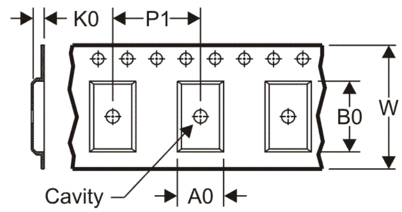
- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION

REEL DIMENSIONS

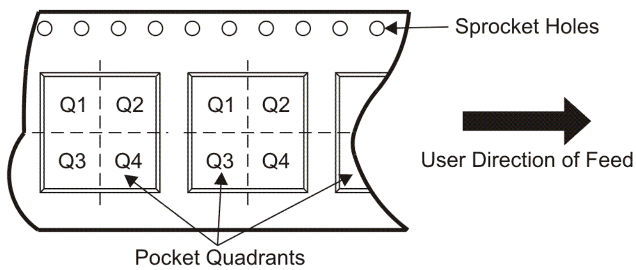


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

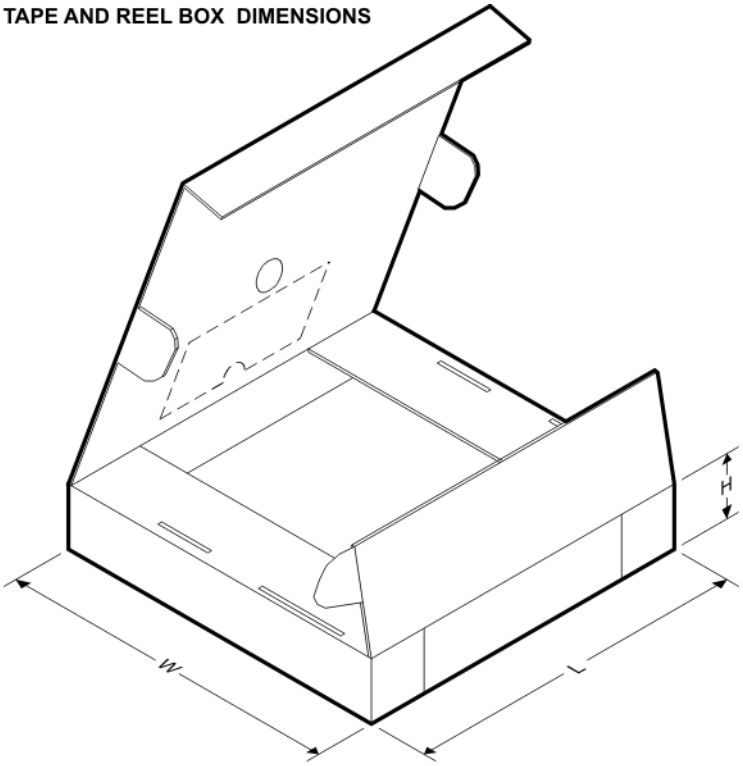
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLC2201CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC2201IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC2202CDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLC2202CPSR	SO	PS	8	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



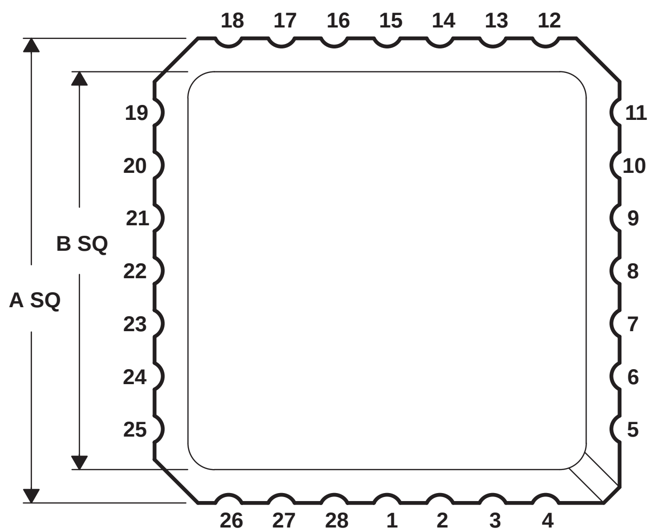
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLC2201CDR	SOIC	D	8	2500	346.0	346.0	29.0
TLC2201IDR	SOIC	D	8	2500	346.0	346.0	29.0
TLC2202CDR	SOIC	D	14	2500	346.0	346.0	33.0
TLC2202CPSR	SO	PS	8	2000	346.0	346.0	33.0

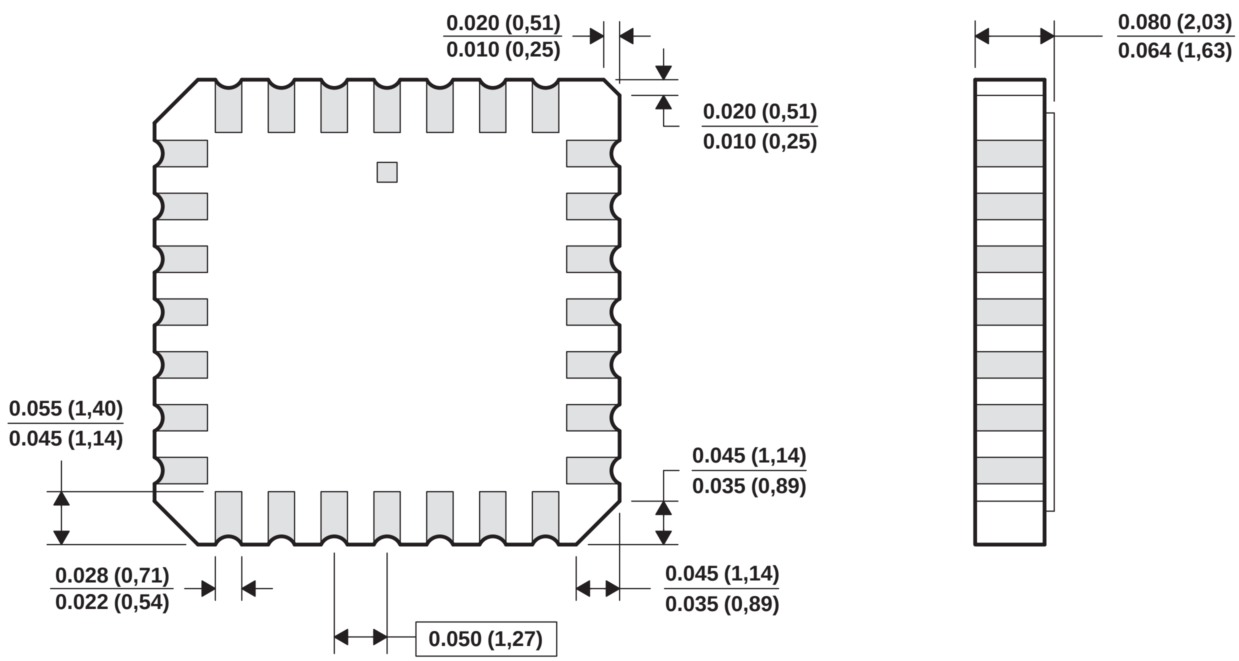
MLCC006B – OCTOBER 1996

FK (S-CQCC-N)** **LEADLESS CERAMIC CHIP CARRIER**

28 TERMINAL SHOWN

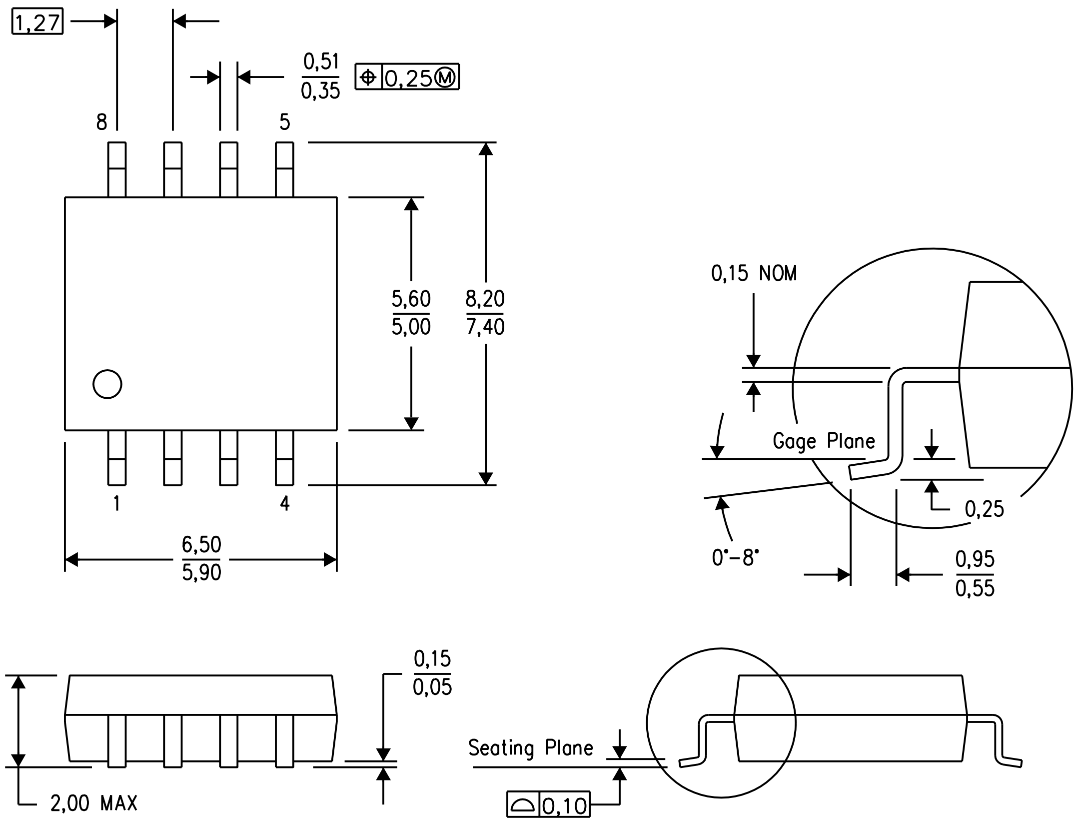


NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.739 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



4040140 / D 10/96

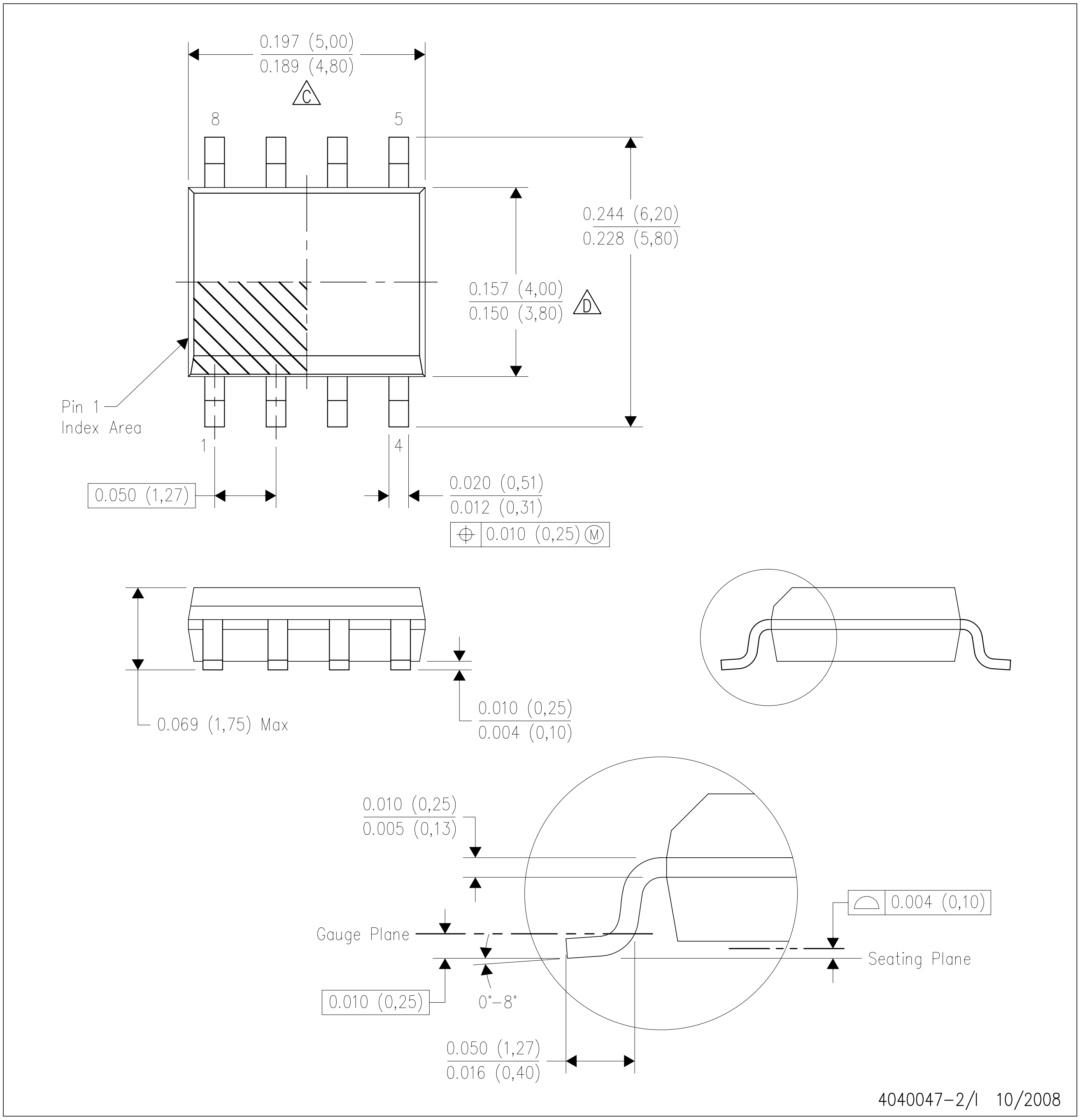
NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a metal lid.
D. The terminals are gold plated.
E. Falls within JEDEC MS-004



4040063/C 03/03

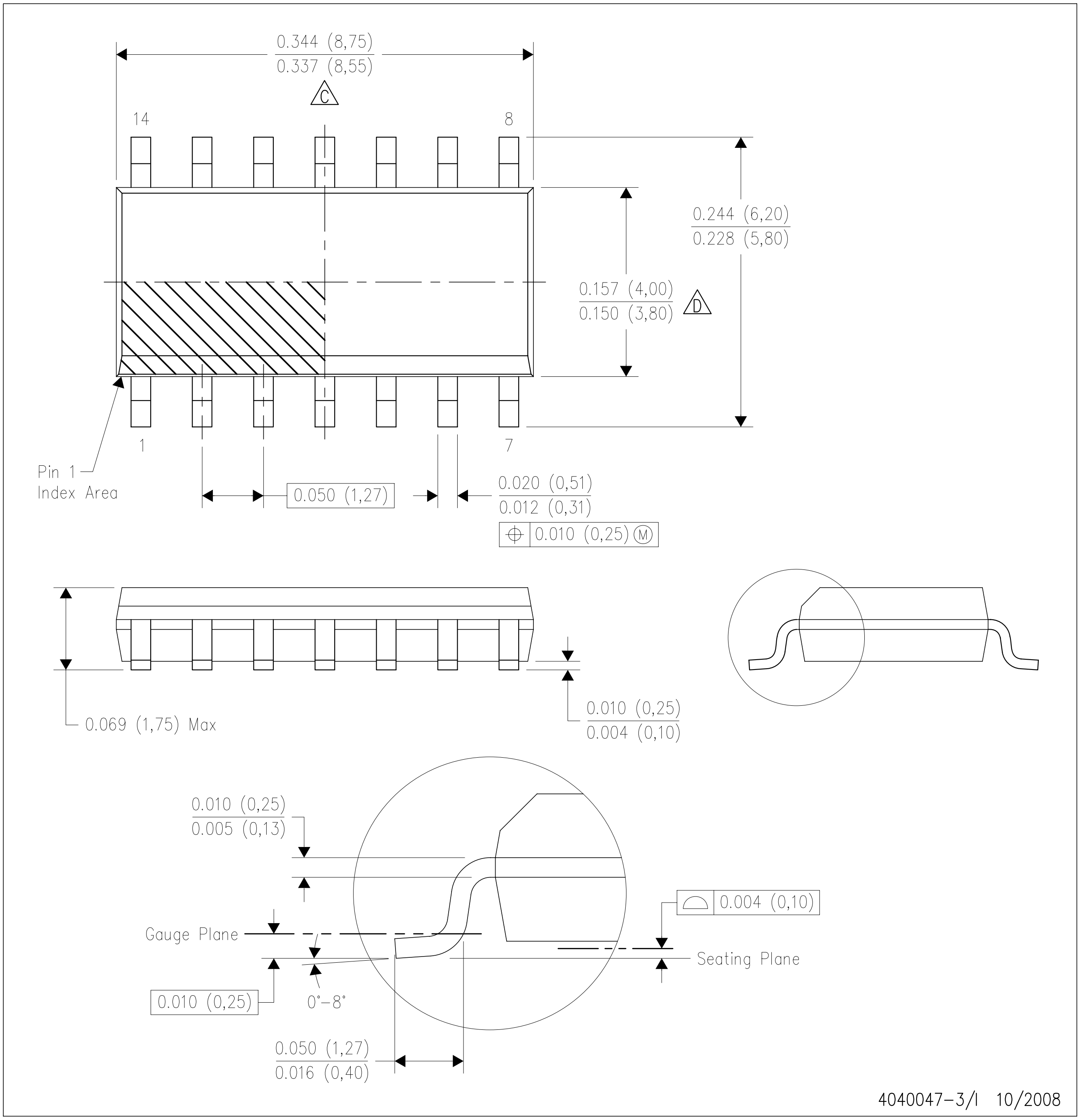
NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

D (R-PDSO-G8) PLASTIC SMALL-OUTLINE PACKAGE



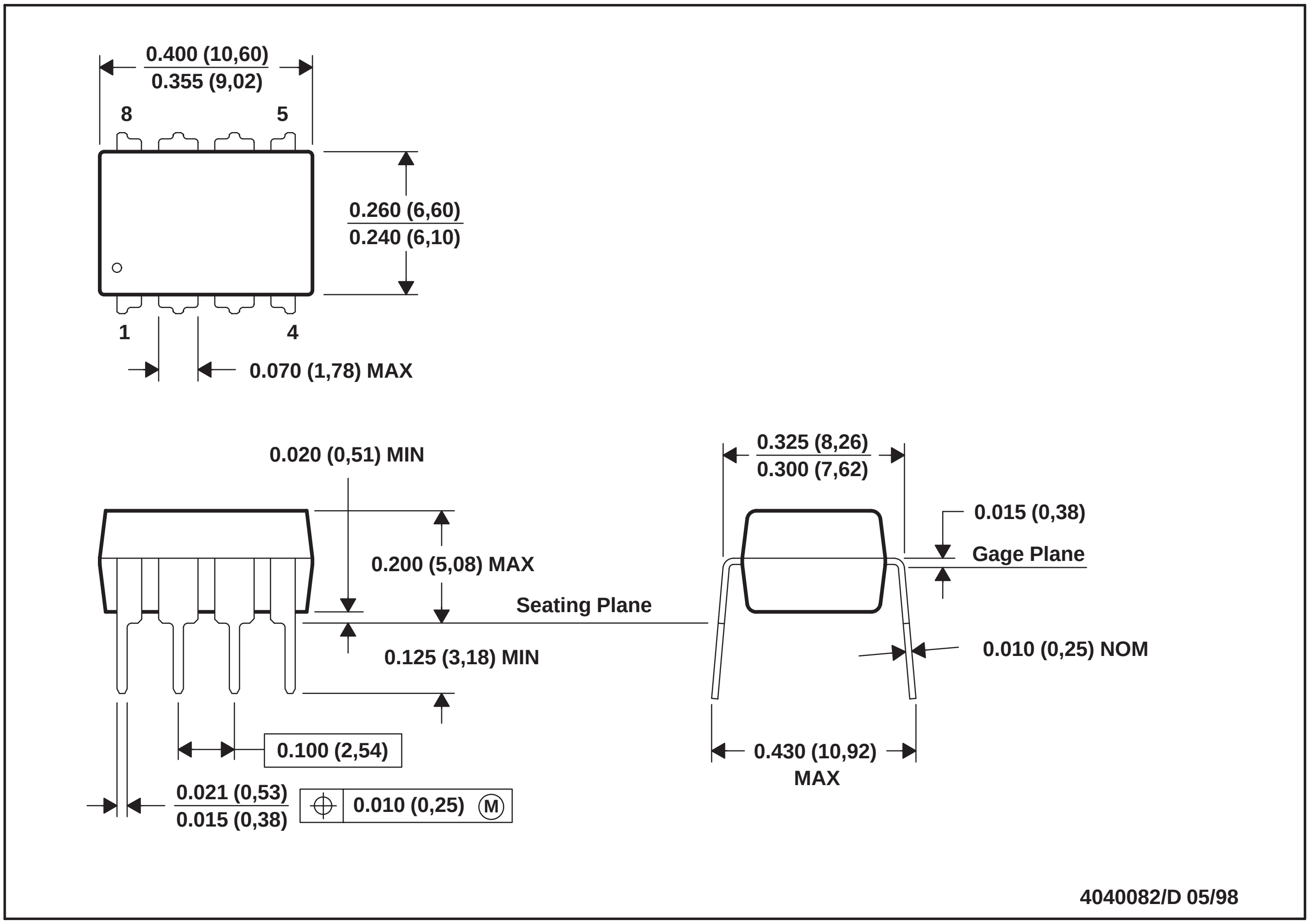
NOTES:
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AA.

D (R-PDSO-G14) PLASTIC SMALL-OUTLINE PACKAGE



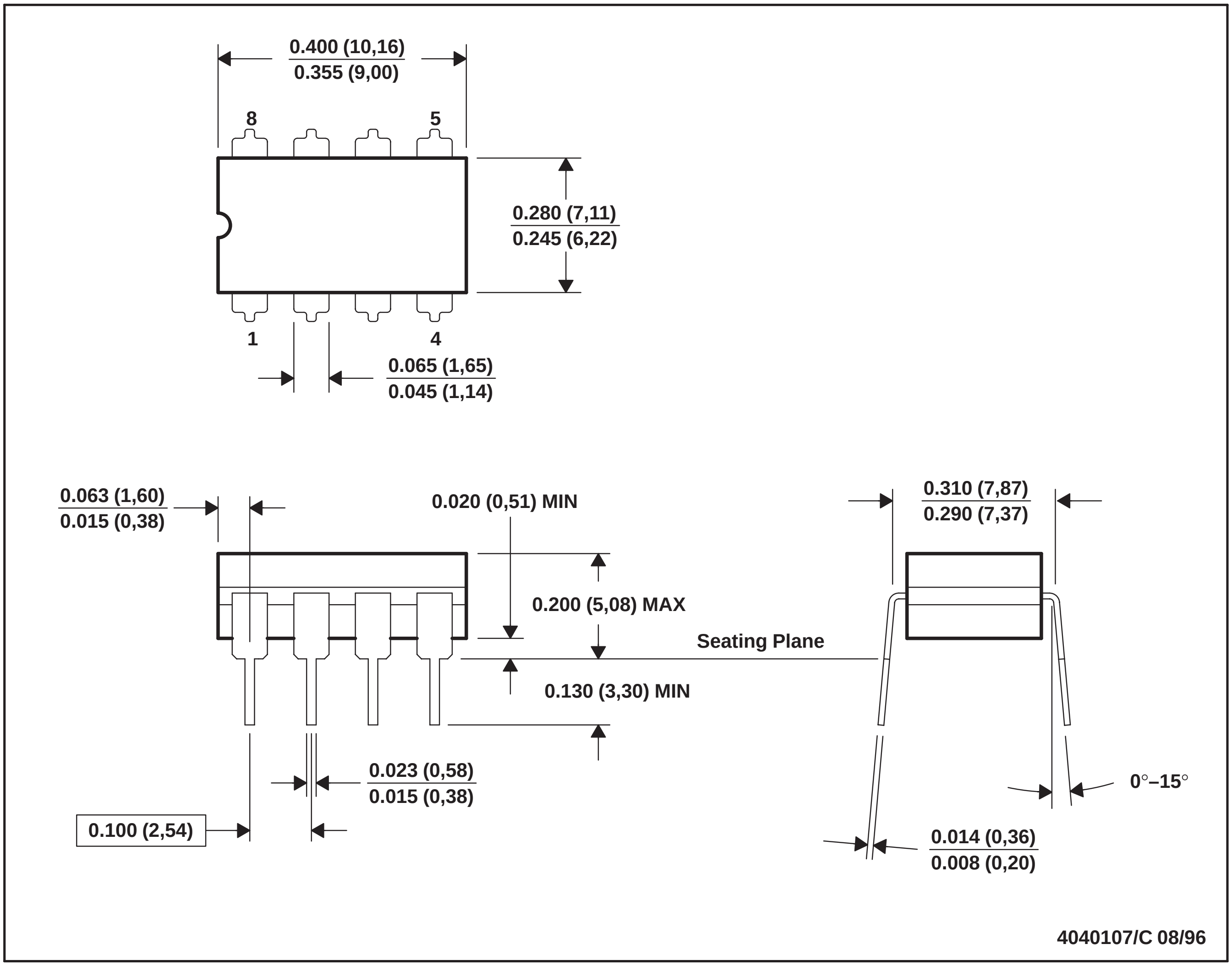
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
E. Reference JEDEC MS-012 variation AB.

P (R-PDIP-T8) PLASTIC DUAL-IN-LINE



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS-001

JG (R-GDIP-T8) **CERAMIC DUAL-IN-LINE**



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification.
E. Falls within MIL STD 1835 GDIP1-T8